

# *Epiphyllum Handbook*

By SCOTT E. HASELTON

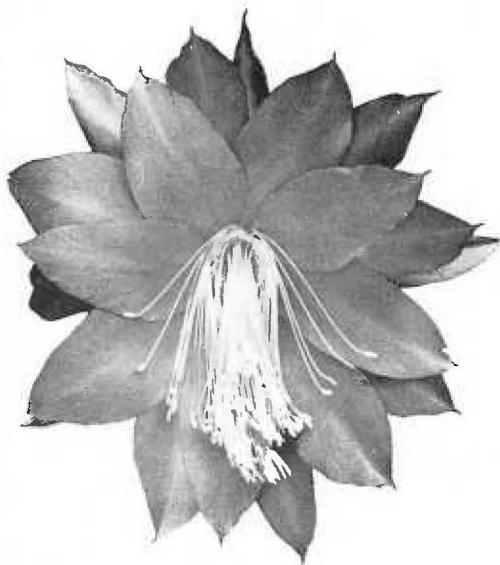


AN INTRODUCTION TO THE ORCHID CACTI

*With One Hundred and Seventy Photographs*

# *Epiphyllum Handbook*

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*With One Hundred and Seventy Photographs*

1951

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DEDICATED TO

*The Epiphyllum Society of America  
and all those who pause to enjoy  
the finer things in life—plants  
and their flowers.*

## P R E F A C E

The compilation of this, the first book on Epiphyllums, required the help of many people. Their splendid cooperation made possible this book which is an introduction to the study of this group of plants and their hybrids, the Orchid Cacti. Without the encouragement and enthusiasm of Mrs. Gertrude Beahm and Mrs. Maybelle Place, this work would never have been completed.

The commercial dealers have been most helpful and everyone has shown a real love for these plants. R. W. Kelly's collection has been used to a good advantage over a two year period; recently it has been acquired by the Beahm Gardens. Mrs. Theresa Monmonier, owner of the Ventura Epiphyllum Gardens, has given us every courtesy in our work. The Beahm Garden, being conveniently located, has contributed a mass of material to round out a book of this kind; both Mr. and Mrs. Beahm have given generously of their time as well as to furnish two color plates for our enjoyment. The plants shown in Plate I were arranged in the garden of Cactus Pete, where countless hours of assistance were given the author. The Coolidge Rare Plant Gardens have a natural stage for photography in their "Jeweled Corridor."

We acknowledge with appreciation the following photographs: Figs. 1 and 52, J. Stewart Boyles; Fig. 57, A. T. Williams; Fig. 79, Sunset Magazine; Fig. 92, Ladislaus Cutak; Figs. 93 and 134, Curt Knebel; Figs. 100 and 158, Mrs. Theresa Monmonier; Fig. 110, T. MacDougall; Fig. 107, E. J. Alexander; Fig. 115, R. H. Lahmeyer; Fig. 140, Ruth Hodgson; Figs. 91, 98, 103, 106, 108, 111, 113, 116, 119, 122, 124, 126, 127, 150, Britton and Rose; Fig. 148, Kakteenkunde; Fig. 117 and 159, H. M. Wegener. The color photograph and 125 black and whites were by the

## P R E F A C E

author who has endeavored to give proper credit as to where they were taken.

We thank Wm. Taylor Marshall for his critical and helpful suggestions. Last but not least we are appreciative of the patience that was required of Miss Helen Sloan in putting a book of this kind into type.

There are many others who would have been as generous in their assistance, but war-time travel restrictions limited the author to a local area. The Epiphyllum Society of America\* will carry on the work and report the many interesting observations in the other gardens.

Any first book has its many problems and controversial issues, especially so if it is the result of one man's opinions. In assembling the opinions of many collectors, growers, botanists, and hobbyists, we have been able to present sufficient basic material for further works. Thanks to all those who helped lay the groundwork toward the further study of Epiphyllums.

\*This Society was organized by the author. Mail addressed to 132 West Union Street, Pasadena, California, will be forwarded to the proper officers.

## FOREWORD

OF THE myriads of plants being grown for their flowers, the Epiphyllums are among the most deserving of first place because of exotic beauty. How the unpretentious branches of these plants can suddenly put forth huge buds that burst open into spectacular flowers at sundown, is one of the miracles of nature.

Few people realized, until recently, that these gorgeous ten-inch flowers belonged to the cactus family or that there were any other colors except white. If more plant lovers had known that European gardeners had developed an array of beautifully colored flowers as far back as a hundred years ago they would not have been content with their *Epiphyllum oxypetalum*, the plant commonly called Night-blooming Cereus. Today, thanks to American growers, the hybrid Epiphyllum has attained its place among the old favorites such as the begonia, orchid, camellia, rose, iris, and gladiolus.

Epiphyllums have the advantage over most of the other plants because they are adaptable to culture in the sun windows, open porch, lathhouse, or in the ground in sheltered locations of the semi-tropical zones. It is not surprising that most of the widely read magazines and garden papers are devoting generous space to these popular plants and full color illustrations challenge anything more beautiful or spectacular.

The rose, the tulip, the begonia, the iris, and the many other fine plants will always have their place in a garden and it is not the purpose of this book to encourage one to sacrifice them for Epiphyllums. When familiar plants can be supplemented by hundreds of relatively new flowers there is a sudden awakening of garden interest as the wealth of new material becomes available.

The purpose of this book is to help those who have a newly



## FOREWORD

acquired interest in Epiphyllums to know their fascinating history, their culture and propagation, their differences and similarities, their names, and their possibilities. In other words, to help one to know and enjoy his plants to the fullest extent.

Do not expect this book to be an easy way to identify one of those 3000 hybrids. The first step is to encourage a universal form for making complete descriptions with standardized color names. Gradually the obsolete and duplicate names will be dropped and the remaining good names will carry full descriptions. A yearly check-list may be published, and from this a key may be formulated that can be used to trace the name of any plant. The key may be based on color of flower, shape of flower, or a combination of characters.

We have made translations of most of the foreign publications so that the wealth of their experiences are available to us. Many growers have generously shared their knowledge in this first Epiphyllum book, which is a background to further study and research. If this book creates new interest in these plants, stimulates further publications or awakens criticism, it has accomplished its purpose.

SCOTT E. HASELTON

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## Orchid Caeti

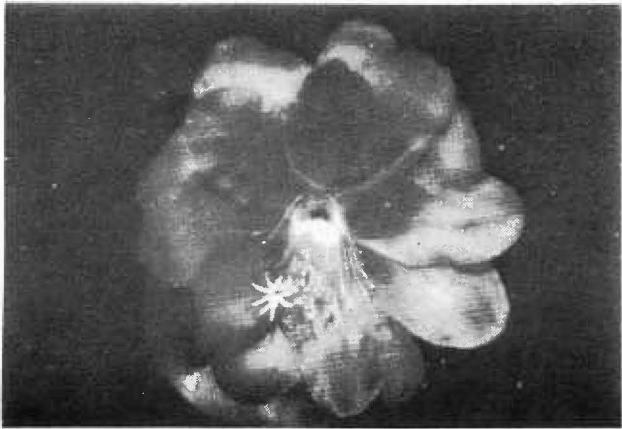


PLATE II

*DARDANELLA* has rich blood-red, medium-sized flowers of a beautiful sheen. The petals are wide and rounded, with wavy edges. The flowers open wide and resemble a giant hibiscus. The plant is a basket-type, with wide, wavy branches having a reddish tinge. This hybrid was produced by Theresa M. Mommonier.

## Orchid Cacti

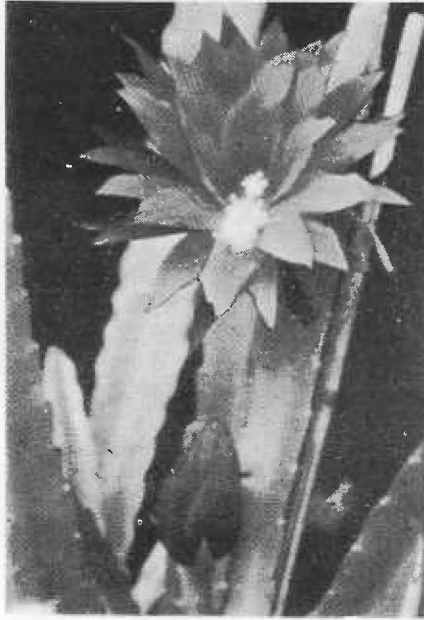


PLATE III

*PROF. EBERT has one of the finest flowers, with overlapping, pointed petals. The strong magenta color lightens toward the inner petals. The flower opens wide, is firm, and lasts well. It is one of Curt Knebel's introductions, listed as his No. 19.*

*Color plate courtesy of the Beahm Gardens,  
2686 Paloma, Pasadena, California*



## Orchid Cacti



### PLATE IV

FLOR DEL SOL was named by Coolidge Rare Plant Gardens for the variety previously known as Henna. The latter name was discarded because it is merely a color name. This vigorous plant has a distinctive glowing "henna" color which is best described as a brownish-vermilion. The many narrow petals are of uniform color and the flower is somewhat cup-shaped. Photographed in the "Jeweled Corridor" of the Coolidge Rare Plant Gardens, 889 North Foothill Boulevard, Pasadena, California.

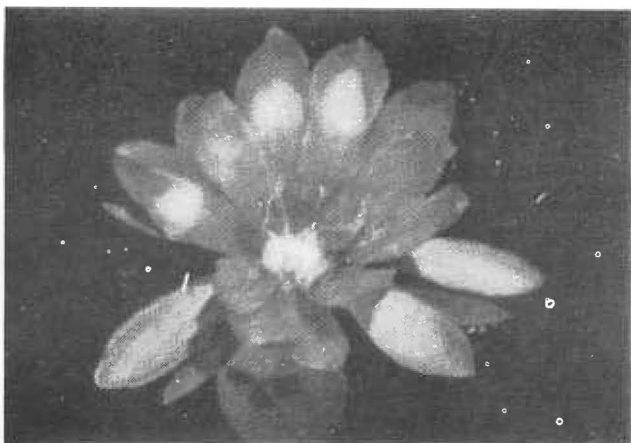
## *Orchid Cacti*



### PLATE V

*POLDI SVETNIC is an import from Curt Knebel of Germany. The plant is a fast grower, with flat branches. It does well in a hanging basket. The many white flowers open flat and are about seven inches across. The narrow petals are numerous, giving a double effect. No collection is complete without several of the white hybrids. Photograph of a plant in the Bealm Gardens, Pasadena, California.*

## Orchid Cacti



### PLATE VI

*SUN GODDESS* has one of the largest flowers of any of the hybrids—ten to eleven inches across. The color is orange to nasturtium-red with a touch of magenta at the base of the petals. It has been called by various color names such as Copper, Copper Color, Bronze, etc., as well as Sun Fugitive and Hugh Evans. Color plate courtesy of Stanislaus Desert Gardens, 8720 MacArthur Boulevard, Oakland, California.

## *Orchid Cacti*

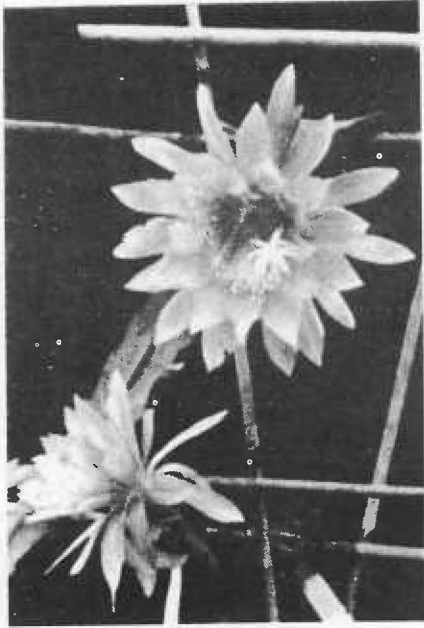
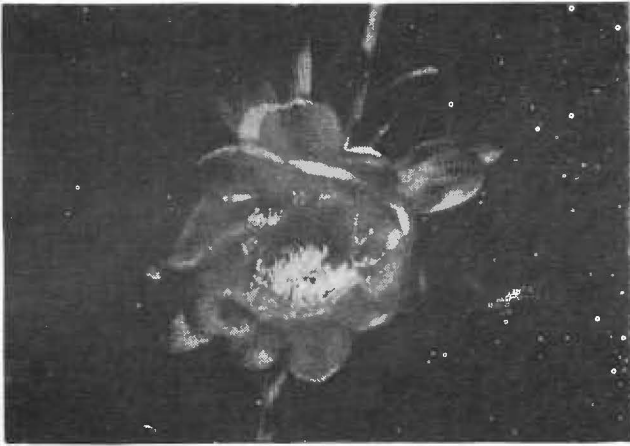


PLATE VII

*NIMBUS* has an outstanding pink flower with about thirty-five overlapping petals, giving a double effect. The tube is green with many prominent scales from one-quarter inch to two inches long; the latter merging into the outer flaring petals. This new hybrid was developed by Coolidge Rare Plant Gardens, 889 North Foothill Boulevard, Pasadena, California. Color plate courtesy of this grower.

## Orchid Cacti



### PLATE VIII

*Calender's PFAUDR has a distinct cup-shaped flower with many wavy petals. The inner petals are a gorgeous solferino purple, deepening toward the outer petals, which are channeled or spoon-shaped. The circle of stamens is a pale magenta with cream-colored anthers. When this plant is in flower it predominates in form and color. Color plate courtesy of Bealm Gardens, Pasadena, California.*



## Orchid Cacti

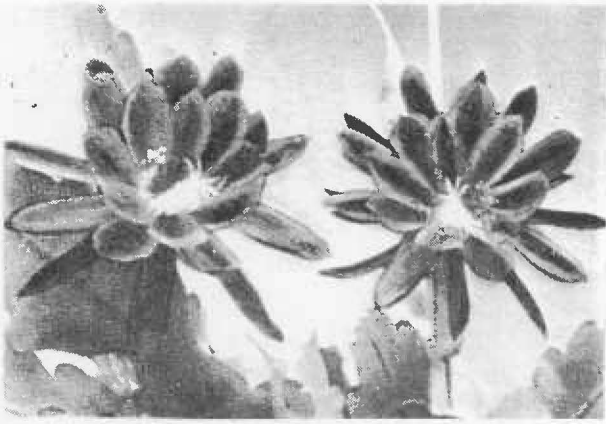


PLATE IX

MARSEILLAISE AND BLAUE FLAMME *both have purple flowers with center stripes deepening to vermillion. The former hybrid has less pronounced stripes with pink toward the edges of the petals. Blaue Flamme has lighter margins, almost white. The outer petals are a darker color which sets off the distinct markings that are in contrast to the flowers of solid color. There are several hybrids in this group with orchid, pink, and white markings. Color plates courtesy of Cactus Pete, 5440 Valley Boulevard, Los Angeles, California.*

## INTRODUCTION

IN ORDER that a general view may be had as to the origin of these Epiphyllums let us look back a few million years. We find endless changes in all plants in their adaptation and struggle for survival. When one delves into the distant past, a few thousand years is of no consequence.

Let us view this globe in these remote ages as a shining ball with a slight stain upon its surface indicating the presence of oceans and a still fainter stain representing dense masses of vegetation. In this insignificant film occurs all life and experiences; our passing empires; our archeology and history; our wars, conquerors, poets; all apparently insignificant except to ourselves and probably to a supreme architect. Plants of the Paleozoic era are known only by their fossils; life is in a slow but everchanging flux; our Hitlers and Mussolinis prance on the stage of life for a few brief moments in the eternal span of time.

Scientists are agreed that all forms, both animal and vegetable, originated on this planet millions of years ago from one or a few types of single cells. These cells of extremely simple form being only slightly different from aggregations of molecules (small particles of matter), were scarcely distinguishable from non-living forms. Probably ages elapsed before the process of evolution combined and recombined cell-forms which differed from one another by a small factor. One used sunlight to bring about changes within itself to form the green coloring matter of plants called chlorophyll, while the other forms had to continue to exist by obtaining their food materials from those forms which manufactured this chlorophyll.

Imagine how in a remote period of time, when the earth was warm, these tiny living forms along the shores of the oceans would be alternately washed upon the beach and back again into their habitat, the sea. Now imagine what great value it would be if some of these sea-living cells developed projections which

could absorb moisture and nourishment from the sand. Thus probably developed the earliest roots which made possible the forms of vegetable life which could live upon the earth.

Like the parable of the bible, some of these fell on stony places, some on fertile soil; in fact some fell on every conceivable condition. Those which were not adapted to their surroundings died by the billions, while those which varied no matter how slightly in the direction of survival, lived to carry on a new generation.

After millions of years some of these combinations of cells developed to the point where they became perfect plants, that is, having roots, stems, leaves, flowers, and seeds. Some had varied in the direction of requiring a moist condition and became water plants. Those growing in favorable localities developed into rank vegetation. Others found themselves in areas that were becoming arid and in adapting themselves to increased drought conditions became what we know today as succulent plants.

It is generally believed that all cacti are descendants from a common ancestor—perhaps the true-leaved *Pereskia*. This is quite possible because of the comparatively restricted area of their distribution due perhaps to their more recent introduction into the plant world and not having had sufficient time to be more widely dispersed. The distribution of *Epiphyllums* is even more restricted than the other cacti.

Among the flowering plants of the earth are large groups having similar characteristics due to similar climates or growing conditions. Development along these lines is called parallelism. Thus the *Euphorbias* of Africa are somewhat like the *Cacti* of the Americas. This is proof that they are not all from a common ancestor and it is useless to try to find links that will connect them.

We do find among plants large groups having similarities, perhaps not so much in their outward appearance, as in the structure of their flowers. Environment changes the form of a plant much more quickly than the flower and seed. Therefore grouping or

classifying plants is more often based on flower structure. These groups of plants are called families of which the Cactaceae is the one with which we are now concerned. Families are again divided into genera or distinct types such as *Epiphyllum* in the Cactus family or the *Yucca* in the Lily family.

The cactus family consists of plants which are all drought resisting. They either developed without true leaves, gradually changed their form, or threw them off all together in order to lessen the area through which plant moisture evaporates. The leaf functions were transferred to thickened stems or branches which converted their juices into molecules called pentosans which do not readily give up water by evaporation. Spines or scales may be the final traces of the original leaf forms.

Thus we may say that in the family Cactaceae we also find epiphytic plants possessing flattened or leaf-like branches sometimes 3-sided, areoles (specialized organs) on the margins of the branches, practically no spines, no true leaves, and large flowers with long tubes. A plant must have these qualifications to be included in the genus *Epiphyllum*.

Within the genus there may be plants with well defined characters such as size or shape of flower, shape of branches, color, or number of floral parts. These groups are reclassified as species. There is no law as to what constitutes a species and it may be one man's conception which is recorded and then followed or rejected. The intergrading of species is often a fine point and it is here that we see the slow but constant change in plants. It may take many years for a character to become "fixed" and there are continued reports of species being "lost" in our present day generation—plants that failed to make the adjustment to environment.

*Epiphyllums* are relatively new in the history of plant life, perhaps only a few thousand years old, but they have survived because of their unique epiphytic habit. They stand late in the evolutionary scale because they are among the most advanced plants—bearing flowers, fruit, and seed. While the *Iris* dates back

to biblical records and is mentioned in history of many centuries, the first record of Epiphyllums is in 1753. Being New World plants, this is not surprising, and they no doubt existed a great many years before early navigators discovered them.



FIG. 1. Epiphyllums are epiphytes and grow in trees along with orchids and bromeliads.



## THE PLANT

### *Its Parts and Their Functions*

DID YOU ever watch a flower unfold with its almost life-like movements? When an Epiphyllum flower unfolds in the early dusk you can actually see the petals open, the stamens move into position, and the stigma expand its finger-like sections. The fading flower, especially *E. darrahii*, will fold itself into a tight envelope, if exposed to extreme warmth, within a few minutes. There is no wonder that one asks where plant-life leaves off and animal-life begins.

Plants, like animals, are composed entirely of cells and the products of cells. If we view one of the cells containing the life-blood, chlorophyll, through a high powered microscope we see a most revealing sight—these green microscopic bodies seem to be chasing each other around as though they were insects without destination.

All leafy plants, and stems functioning as leaves, must have their green cells or they cannot transform food into growth and flowers. The action of sunlight is required as the motivating energy of these green bodies as they convert plant foods into various cells resulting in growth and woody tissues.

### ROOT SYSTEMS

Let us start with the roots of an Epiphyllum. The hair-like, fibrous roots act as feeders for absorbing water and carry the required dissolved minerals to the stem of the plant. From here it continues upward to the green branches where it is combined with oxygen from the air and converted into sugars and starches that are required for plant growth. As the main roots become larger they anchor the plant to the soil whether it is growing in a pot or in the crotches of a tree containing leafmold. If a little thought is given to the root structure it will be seen that water

soaked soil will suffocate the roots which require aerated soil to function.

The root system is comparatively small and does not depend



FIG. 2. Conway's Giant grown in a 4-inch pot requires regular feeding.

on deep feeders. The frequent rains in their habitat are rapidly absorbed and all conservation is left to the thickened branches.

The porous leafmold retains sufficient root moisture to keep the fine roots from drying out so that with each rain they are in condition to function without waiting to develop new ones. Neither are the roots widely spreading; they are confined to a small area thus leading to the conclusion that pot bound plants flower more readily than plants in large containers. One of the advantages of *Epiphyllums* is that in medium size pots one can grow a nice flowering-size plant. A crowded root system may force flowers but it usually causes them to be smaller and poor in color unless properly fed.

## HABIT

The plant form is bush-like, mostly branching at the base with drooping branches. A few types such as *E. oxypetalum* produce more side branches but the ease in training most kinds is due to the neat-growing habit of branching at the base.

In making plant descriptions one should indicate the size of the plant, number and length of the branches, and the growing habit.

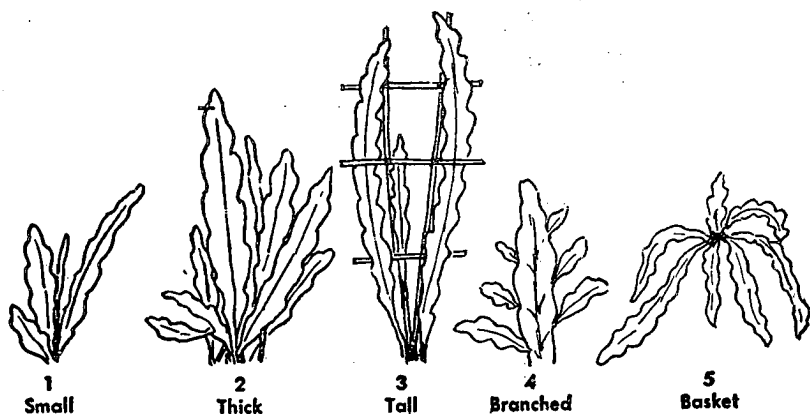


FIG. 3. The growing habit is quite distinct and helps to identify the Orchid Cacti.



FIG. 4. The true species, *Epiphyllum anguliger* shows the typical growth habit. Plant was grown by Mrs. Frank Mark, Los Angeles.

#### BRANCHES

The main branches are often round and woody for a few inches before they become flat or 3-winged. In their habitat where they hang from trees, their branches are often up to ten or fifteen feet long. The smaller types are natural for basket

culture while the larger plants must be tied to stakes, trellises, or have the tips of the branches nipped off. The parentage of the longer branched types may be traced to the species *E. crenatum*, *E. oxypetalum*, or one of the *Selenicereus grandiflorus* hybrids such as Cooperi or Pfersdorffii. Many, such as the *E. ackermannii* and Kaiserin hybrids are more compact, thick, bush forms in contrast to the loose, long-branch types. The width of the branches varies from one to eight inches, the average being about three inches. Thickness varies with the plant, some are paper-thin during the dormant period, others are a half-in thick when in full

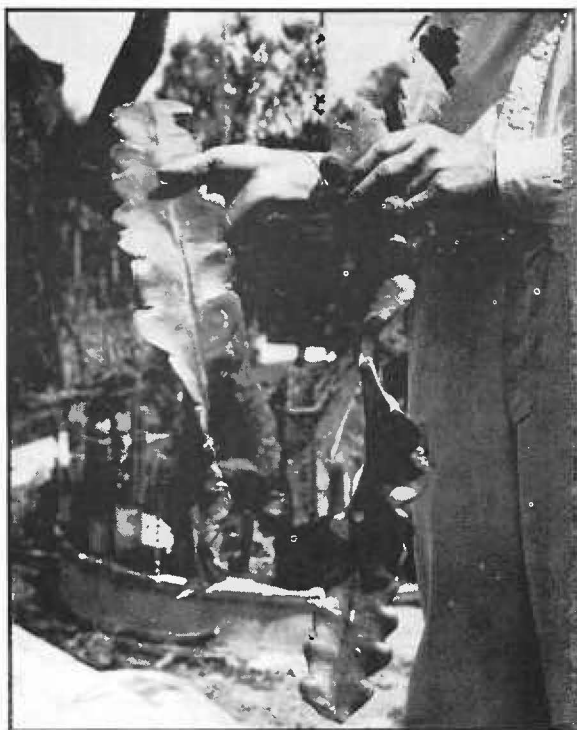
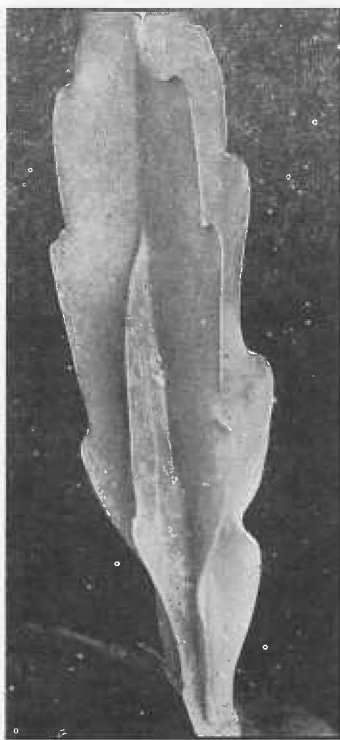


FIG. 5. Frank Mark holds a branch that is 5 in. wide and  $\frac{3}{4}$  in. thick.

growth. Exceptional plants may have branches a full inch in thickness at the base.

The growth of the branches is interesting to observe. Both flat and 3-winged branches may grow on the same plant showing the mixture of *Heliocercus* and *Epiphyllum* parentage. It is not unusual for a branch to start as 3-winged and then flatten out, or just the reverse. Some hybrids are always true to form while others show considerable variation. Parentage can sometimes be traced by this growth.



#### BRANCH DESCRIPTIONS

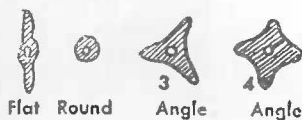


FIG. 6. New branches may start out round and then change to 3 to 5-winged before they settle down to normal flattened growth.

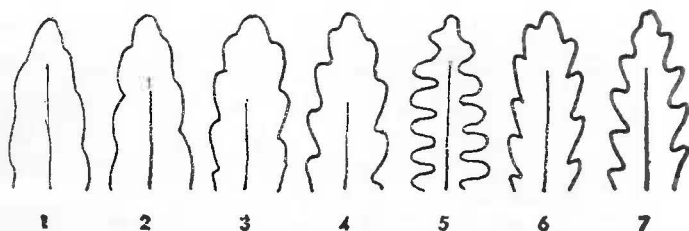


FIG. 7. Shapes of branches.

The edges of the branches have the true cactus characteristic of areoles, set in the crenations, which may contain felt-like cushions of fine hair, bristles or spines, or even small scales (modified leaves). Or the areoles may be "naked" which means they have no appendages. In age, these hairy cushions sometimes drop off but usually a "lively" white cushion indicates flowers or growth. Epiphyllums which bear heavy wool-cushioned areoles are thought to be mass bloomers capable of bearing a flower from each areole.

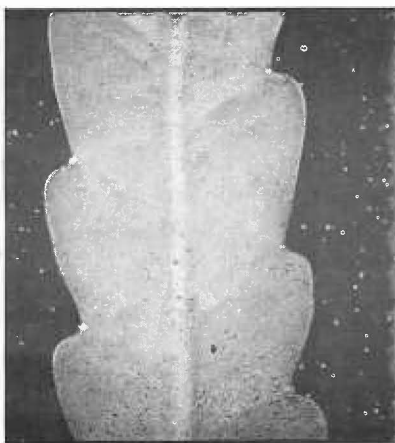


FIG. 8. Typical branch showing areoles in the crenations.



FIG. 9. Areoles with leaf-like appendages called scales.

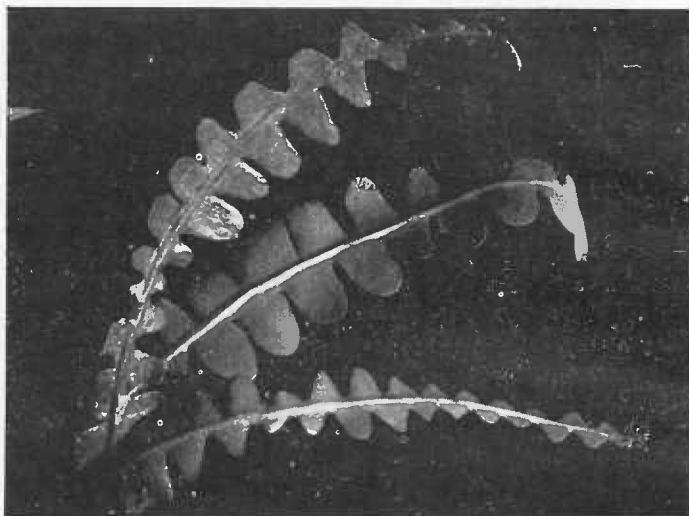


FIG. 10. Interesting variations in branches of *E. darrahii*—*E. anguliger*.  
Note the strong midrib.

Seedlings are usually quite spiny and possess other characteristics by which parentage may be traced. The true species seldom have any traces of spines in older growth whereas the hybrid parent *Heliocereus* is quite the opposite. The theory seems to apply here as in the other cacti—those exposed to the most sun are more heavily spined. Epiphyllums are quite shade loving while *Heliocereus* grow, not in trees, but in less protected areas on the ground—in fact the latter name means “Sun *Cereus*.”

The rounded crenations in which the areoles sit are sharply or deeply notched according to the species; this is one of the determining factors, but not always the best, which segregates one species or a hybrid from another. The notches are always alternated, never opposite and either quite near together or “distant” according to the type.

The body of the branch consists chiefly of a soft pulp with sticky mucilaginous sap. The branch is supported by a woody



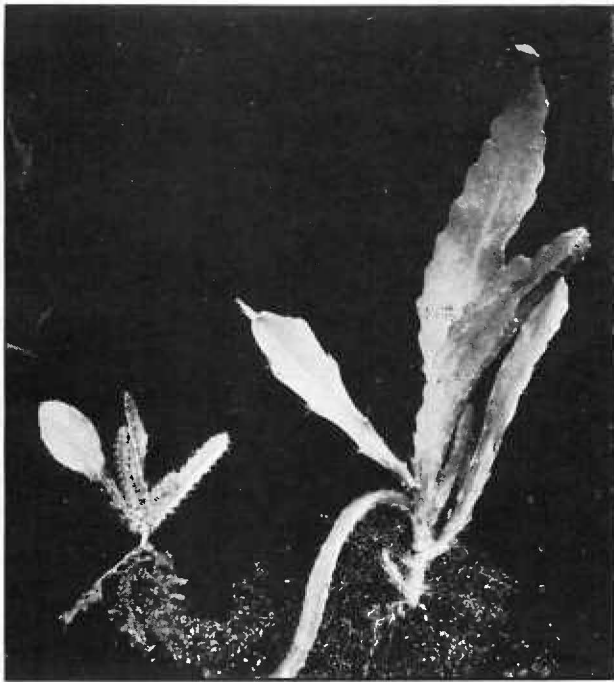


FIG. 11. Seedlings start with 4 to 6 angles and finally become 3-winged or flattened.

midrib with smaller lateral ribs extending to each areole. The outer skin or epidermis is relatively water tight because of the small stomata (respiration organs) which are like inverted funnels. The evaporation of the moisture from the plant body is slight, first because the sap is mucilaginous, secondly because the construction of the stoma permits only slight evaporation. However, cacti, like all other plants, do breathe and require air. If you place a small necked bottle over a small new branch and suspend it while the plant makes growth, you will find that the bottle is finally "corked up" as the growth enlarges and fills the neck. Then you will see the bottle gradually fill with water that is

transpired through the stomata. Within a year the bottle will contain a healthy leaf partly immersed in water.

Cacti are especially constructed to expand when there is abundance of water and food material and to contract during a dry or resting period. The air-pores (stomata) also contract, thus further reducing the loss of moisture. A ten-foot cactus may only lose an ounce of water a day compared with the loss of ten gallons in a leafy tree.

The colorless inner cells are in great abundance as storage tissues for the acrid juices. The mid-rib and center of the stem is a strong, whip-like fiber which bends with the wind and does not easily break except in the tender new growth.

Often the branches of a plant will dry back if the roots are injured or if there is not a sufficient supply of moisture and food for its maintenance. You have seen propagators cut back the end of a stem so that the new roots will have less plant body to support while it is developing new roots and growth. Don't expect too small a root system, or one lacking foods, to maintain a large succulent plant.

The branches have further protection in their glistening, wax-like coating sometimes forming a thick deposit of whitish or silvery "bloom." This coating protects the new growth and lessens evaporation. Often the branches show a definite reddish, bronze, or purple tinge which is the concentration of pigment in the cell sap while the cells are developing or the pigment is concentrated for resistance to cold. Strong sun kills both chlorophyll and pigments and the cells take on a pale or yellow appearance. Frost freezes the older growth before it affects the reddish new growth, showing the resistance due to concentration of pigment.

This brief discussion will show why an Epiphyllum needs air. It is advisable to spray the branches with water as this not only keeps the pores clean and open but supplies the deficiency of moist atmosphere. If the stomata are impervious to moisture how can the plant benefit by the humidity in the jungle forests? You

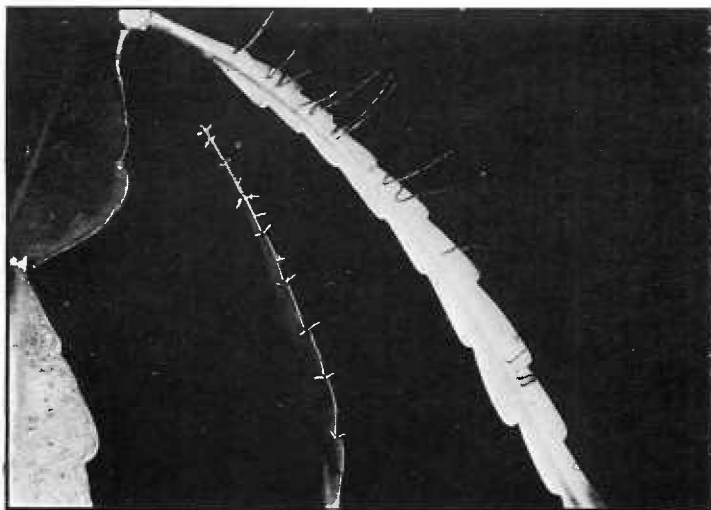


FIG. 12. Air roots seek contact with additional food supply.

will have noted the fine "air-roots" that develop on the tips of the branches or along the mid-rib towards the end of a long branch. These are adventitious roots and do not necessarily arise from areoles. The tropical species have them in great abundance and they serve the purpose of feeding the joints furthest away from the root system. These air roots take moisture from the air or contact with the pockets of soil. Air roots develop best where the air has high moisture content and denote a healthy condition of the plant. This additional adaptation aids in maintaining the moisture content which runs as high as 90% in Epiphyllums.

The Epiphyllums have, through evolution, discarded their true leaves to lessen the evaporation surface and have transferred the leaf functions to the thickened branches. The only traces of modified leaves might be the small three sided scales which are occasionally observed in the areoles. It might also be observed with a stretch of the imagination that the scales on a flower tube

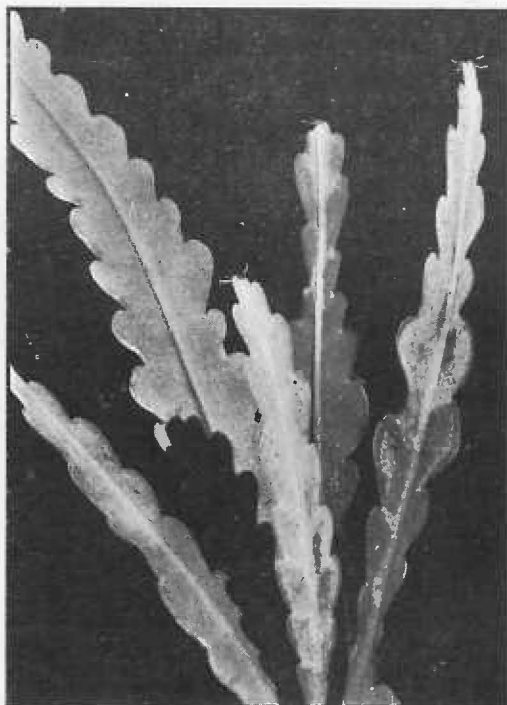


FIG. 13. Ends of healthy branches develop air roots which take hold if they can contact soil.

or even the outer petals are a form of leaf. Botanists agree that an enclosing case for the corolla is a modified leaf called the calyx, however, we do not apply this term to any of the floral parts of an Epiphyllum.

The flowers do not always appear in the same position along the branches of all varieties. Some may flower towards the very base of a plant as in *Cooperi* or along the branch as in *Padre*. Others produce their flowers on the tips of the branches as in some of the white hybrids with *E. crenatum* parentage. Flowers produced towards the base of the plant are sometimes crowded

into the foliage and are not as enjoyable as those produced along the branch. A plant producing flowers at the end of the branches must be robust or the tips bend over with drooping flowers. Hanging baskets present flowers to the best advantage, or if the

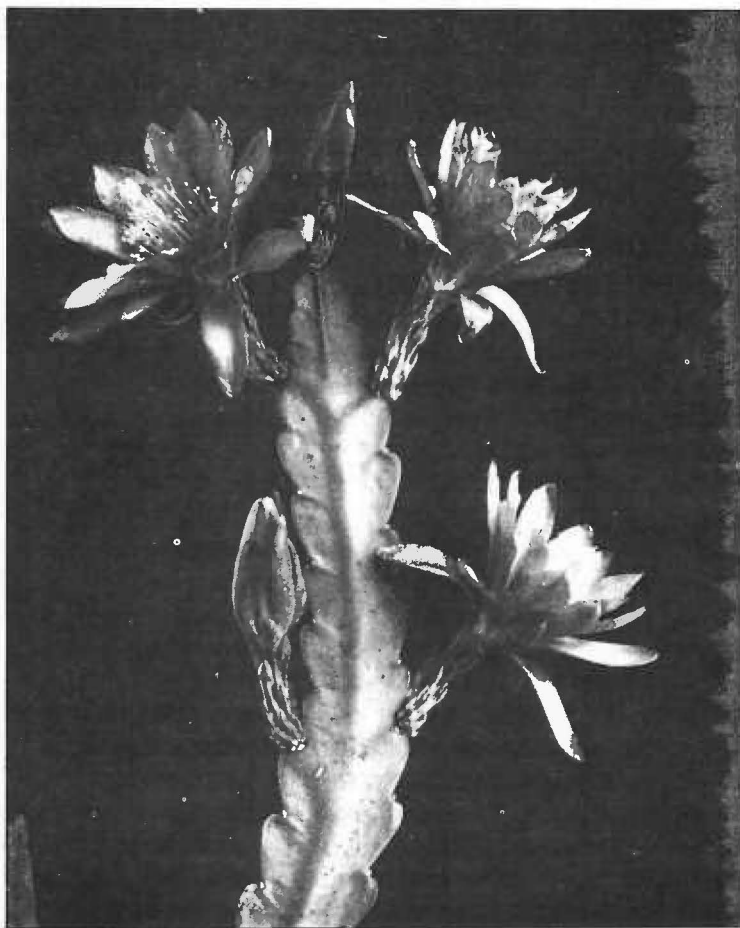


FIG. 14. Fire God with the customary single flower at the areole.  
Note the long scales on the tubes.

plant is one of the larger types, the espalier method is more suitable.

An areole usually produces but one flower at a time; it may produce flowers several seasons if kept in healthy condition. New growth will not flower the season in which it is produced but is considered the best growth for producing flowers the following season. Some growers prune out the old growth after flowering each year in order to force the strength of a plant into the new growth.

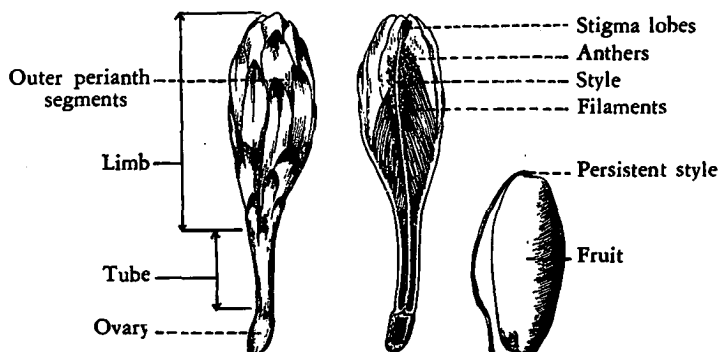


FIG. 15. This drawing of a *Cereus* flower, which is closely related to *Epiphyllums*, shows the parts of a closed flower. The cross section shows the attachment of the stamens and the style. The flower remains are said to be persistent when they continue their attachment to the fruit.

#### FLOWER

Some of the true species are fragrant; this is also true of the colorful hybrids. It is most noticeable in the late evening or early morning before the temperature rises. Fragrance is difficult to describe. The acuteness of the sense of smell varies with different people and fragrance is often undetected, but whenever detected it should be recorded.

It is important to note whether the flower is nocturnal (opens at night) or diurnal (opens in the daytime). The length of time it remains open does not qualify these terms. The lasting quality

and whether or not it holds its color determine its value as a hybrid.

Measurements of flowers are taken as it grows naturally. The length includes from the base of the ovary to the tips of the open petals; usually the tube predominates. The flower width is across the open petals to the extremities of the outer petals. Never force the flower open when giving its size. Sizes should be determined from well-grown plants that have flowered for at least two years as they do not attain their full size the first year. Flowers may open wider or flatter on hot or sunny days than during cool weather or in dense shade.

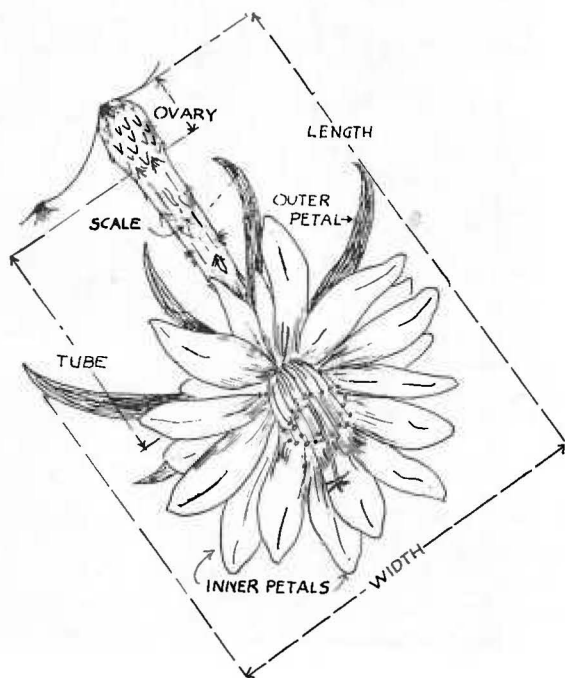


FIG. 16. For flower descriptions the following measurements are important: flower length (from point of attachment on the branch to tip of open petal), width across the open petals, length of ovary, and length of tube.

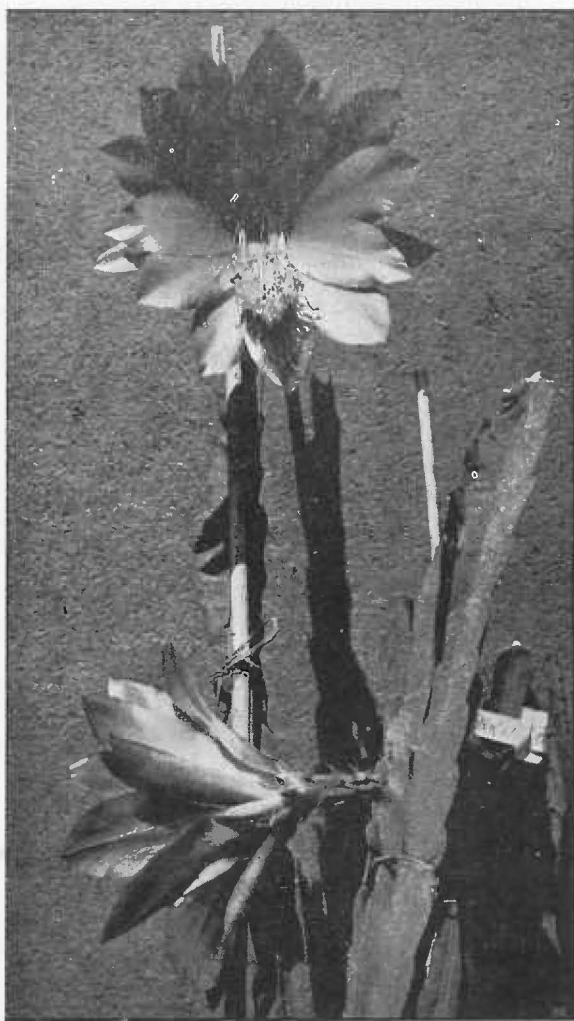


FIG. 17. Typical Orchid Cactus with shorter tube than the true species and having heavy bristles. This *Jenkinsonii* was grown by R. W. Kelly.



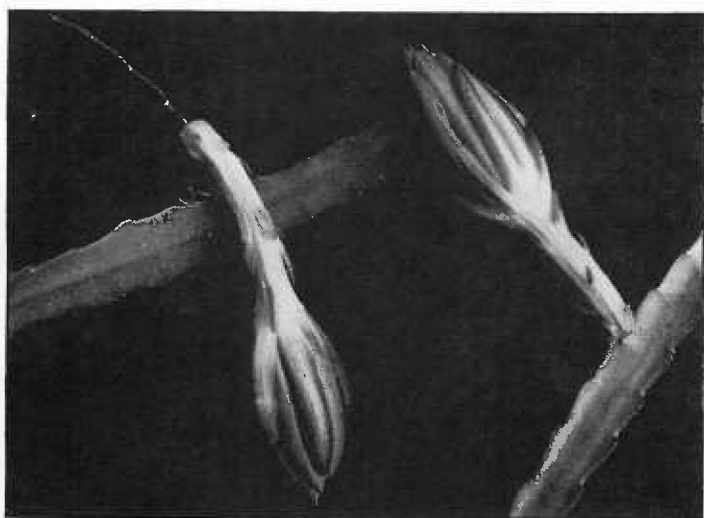


FIG. 18. Buds show how the scales merge into the outer petals.

The flower consists of the ovary which is the undeveloped fruit that is attached next to the branch; the tube, which is the united basal portion; the limb, which is the spreading part of the corolla or petals; the stamens which are numerous in the cactus family; and the pistil. The flowers develop slowly at first from the time the buds make their appearance; after the buds start to grow, six to ten weeks may elapse before the flower opens.

### *Ovary*

The ovary contains the embryo seeds which, when fertilized, develop within the expanding fruit. The position of the ovary, below the point of insertion of the petals, is one of the qualifications of a cactus and indicates that the family is of recent origin—the higher the scale of evolution, the lower the attachment of the pistil, all for the one purpose of most efficiency in seed production. At first the ovary is but slightly different from the tube except it may have scales, bristles, or spines. The swelling does

not occur until the flower has been pollinated. As the petals wither there is a distinct division between the ovary and the corolla which may "persist" or continue its attachment to the fruit. The ovary may be quite spiny in its early stages and may or may not retain them as the fruit ripens.



FIG. 19. Melody has the heavy scales on the tube showing its relationship to *Hylocereus*. Ventura Epiphyllum Gardens originated this salmon colored hybrid.

### *Tube*

The tube is the cylindrical connection between the ovary and the corolla and serves to hold the open petals in position while fertilization is taking place. In some species (*Epiphyllum oxypetalum*) there is a decided curve, like the stems of some pipes, while other varieties may have a thin or thick tube that is straight. Most of the long-tubed varieties are either true species or related to them while those with short tubes show their relationship with *Heliocereus*, *Nopalxochia*, or *E. ackermannii*. The tube may be quite smooth or more or less fluted or grooved. The color is quite distinct in greens, tinted with reds or brown. Usually there are scales with or without bristles in their axils.

One or more ranks of stamens are attached to the tube above and below the closed or narrowed section. It is from this chamber that nectar is secreted into the throat of the flower below the point of attachment of the upper rank of stamens.

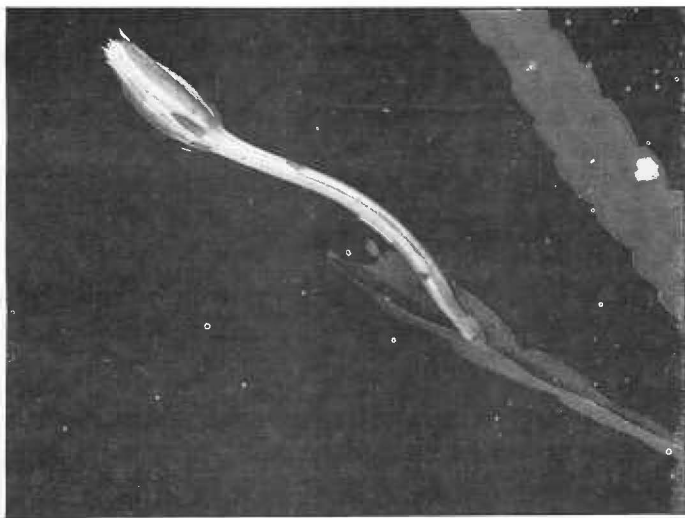


FIG. 20. The true species *E. strictum* has a long tube with a few scattered, "naked" scales.

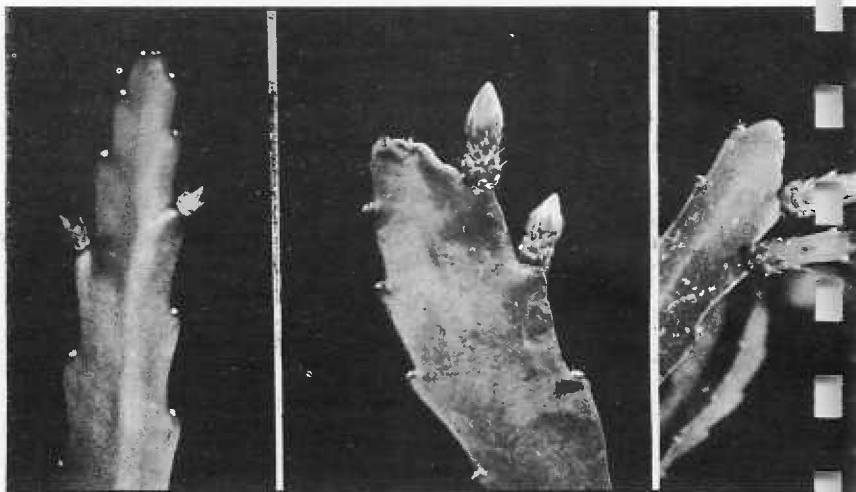
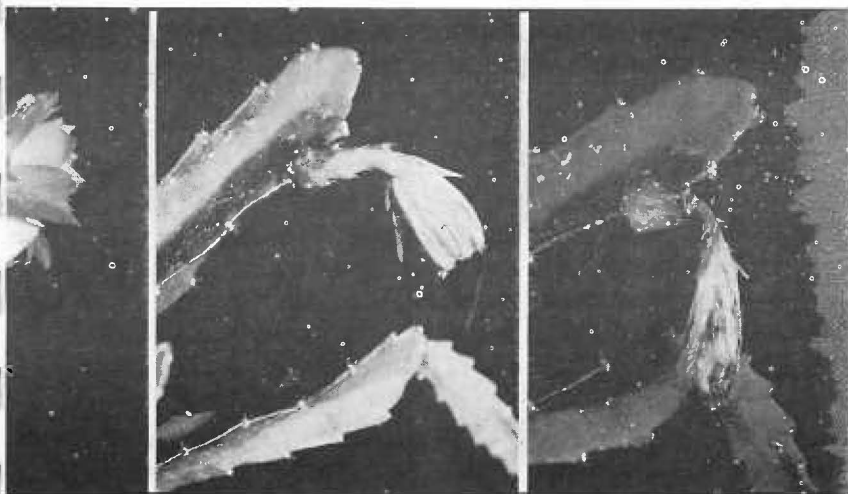


FIG. 21. Development of bud to flower and fruit. Note the ovary becomes more

The tube scales are most interesting because they are the modification of true leaves. Some are small, far apart, and vary in color from greens to bright pink. Usually there are scales that elongate towards the base of the petals. In fact, it is difficult to distinguish where scales leave off and outer petals begin. We do not consider the scales at the base of the petals as a true calyx nor do we use the term "sepals" since a sepal is one of the sections of a calyx.

#### *Outer Petals*

The outer petals, or elongated scales, enclose the flower proper during its development. The color of early buds is often misleading and those which are at first golden yellow or a deep or bright red, may open into a white, pink, or carmine flower. The petals may be green or brown on the outer side with the same color of the inner petals on the inside. The outer petals have much to do with the description of the flower shapes. When the flower opens their arrangement may be:



ominent as the flower ages until the dried perianth clings to the ripening fruit.

1. Appressed close to the inner petals.
2. Flaring, but not at right angles to the tube nor curving backwards.
3. Wide opening (at right angles to the tube).
4. Recurving (bending back towards the tube).
5. Irregular, giving a ragged or twisted appearance.
6. There may be a combination of these arrangements.

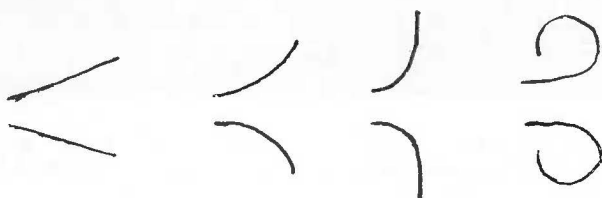


FIG. 22. Arrangement of the outer petals (left to right): appressed, flaring, wide opening, and recurving.

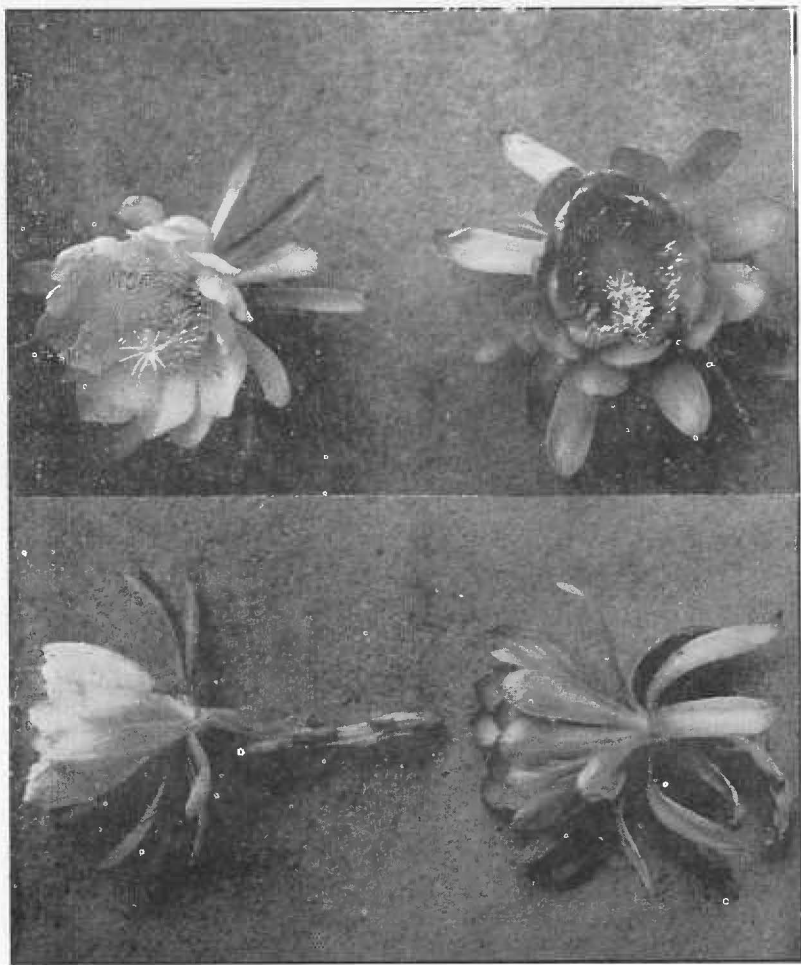


FIG. 23. The white *Londonii*, on the left, is a fine example of wide open outer petals. *Montezuma*, on the right, shows the recurving form.

The tips of the outer petals may have a strong mid-rib that forms a grooved or channeled effect sometimes referred to as spoon-shaped.



FIG. 24. Tips of petals may be: 1. acute, 2. pointed, 3. obtuse, 4. cuspidate, or 5. rounded. These tips may apply to both inner and outer petals.

### *Inner Petals*

The colorful inner petals comprise the corolla. The former may also be referred to as "inner perianth" and each petal as a "perianth segment." We prefer the simple term "inner petals." The form of the inner petals and their color are the two most important characters of *Epiphyllums* and their hybrids. The forms may be:

1. Wide or flat opening, as in Sun Burst, Gloria.
2. Bell-shaped, as in Agatha.
3. Funnel-form, as in Peacockii.
4. Cup-shaped, as in Rosetta.
5. Irregular, as in Mon Cherie.

The notation of one of these forms and the arrangement of the outer petals will give one a fair picture of the flower.

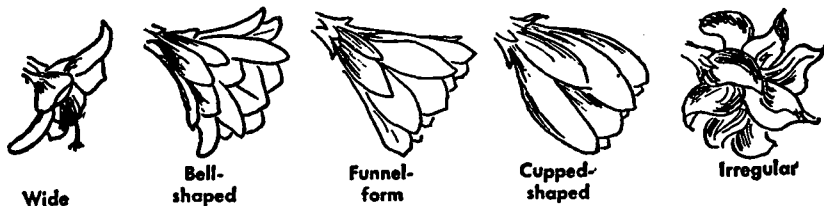


FIG. 25. Forms of the inner petals as seen from a side view.



FIG. 26. A bell-shaped hybrid "My Own" originated by H. M. Wegener. The white flower and the long tube scales show the influence of *Hylocereus* or *Selenicereus*. Note the celluloid tag attached by a wire.



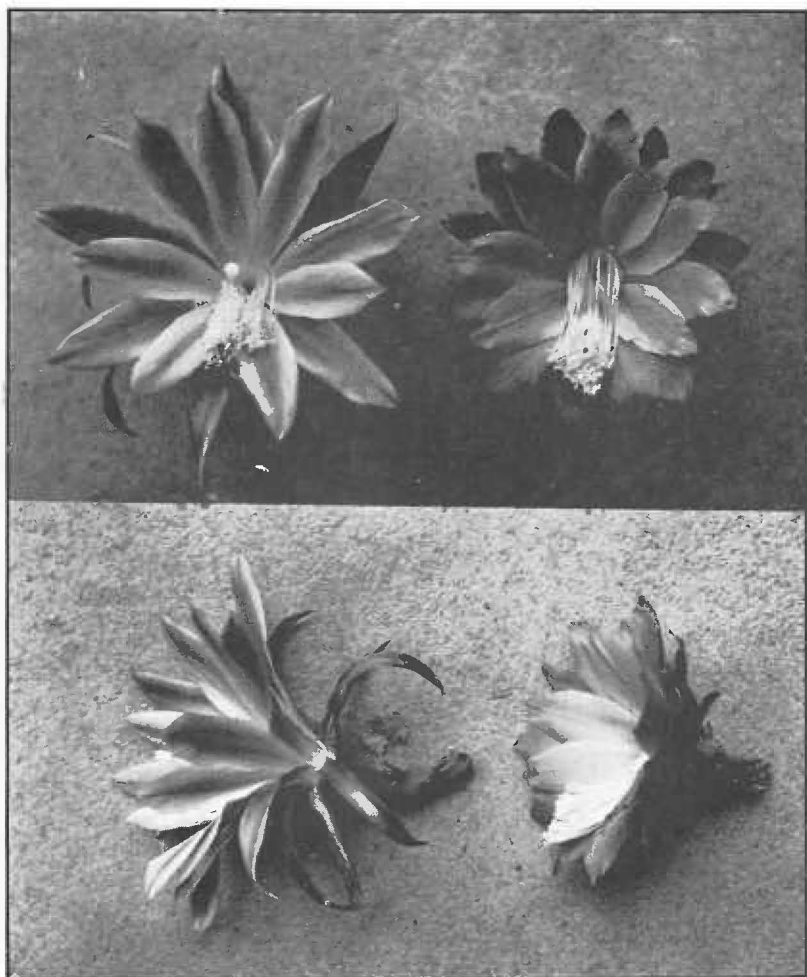


FIG. 27. On the left is the popular *Hermosissimus* opening to funnel shape. On the right is the parent of many of the hybrids, *Heliocereus speciosus*, showing a wide open flower. The upper pictures show the front views of the same flowers.

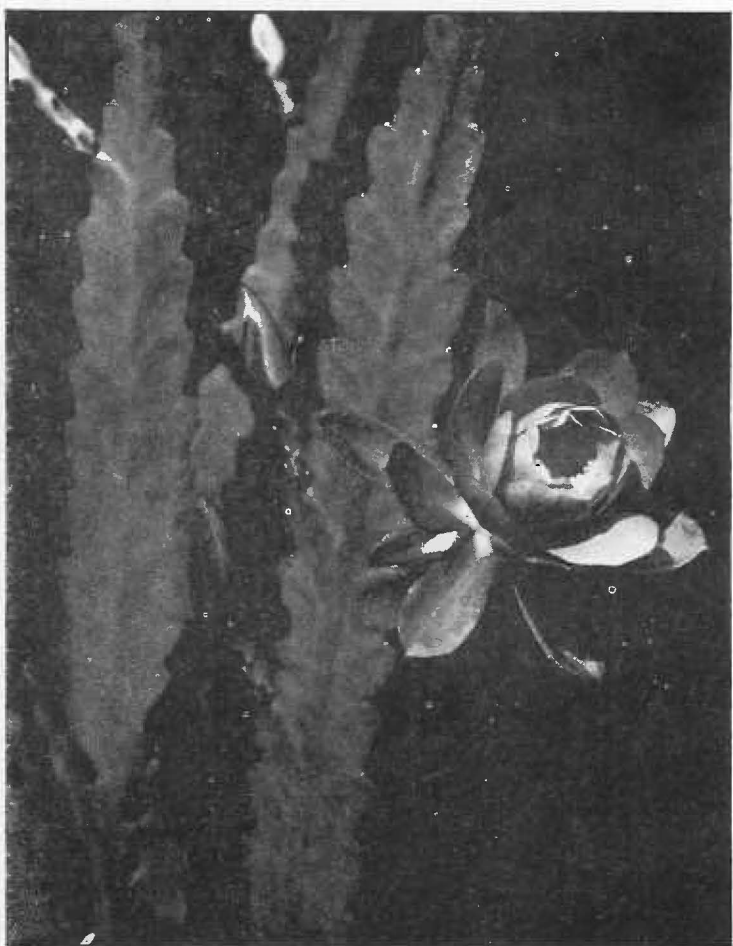


FIG. 28. The well known Rosetta shows the cup-shaped form of flower.  
Photographed in the Beahm Gardens, Pasadena.



FIG. 29. The irregular flower form is shown in Mon Cherie. This flower was named by Theresa M. Monmonier and is a sport of Amber Queen; both types of flowers are often seen on the same plant. The red and yellow streaks give this flower an unusual variegated effect. There is a common criticism of the name as being incorrect French but it stands as published.

In flower descriptions, measurements should be carefully made. They should include the length and width of a single inner and outer petal. The length of stamens and pistil should also be given.

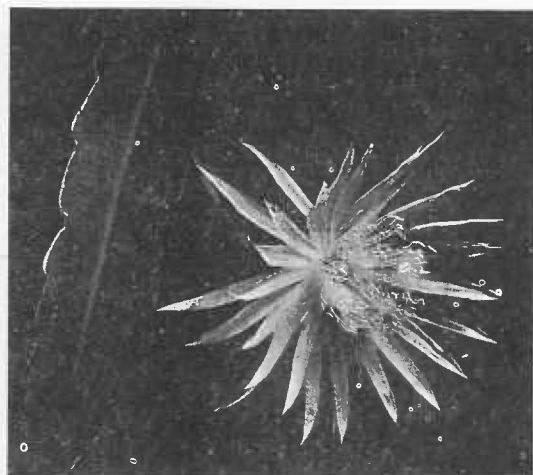


FIG. 30. The true species, *E. strictum*, shows the radiating narrow petals.

The *arrangement* of the petals and their number can be described in a few simple terms:

1. Wheel-shaped, with comparatively few radiating narrow petals as in *E. strictum*.
2. Overlapping, with approximately 15 to 20 petals in two circular rows, as in *Gloria*.
3. Thick, with approximately 25 to 35 petals giving an appearance of three or more rows, as in *Majesty*, *Peacockii*.
4. Loose, with the petals less regular and unsymmetrical; they may be single as in *Hermosissimus* or overlapping as in *Jules Schlumberger*.

The petals may also be ribbony or twisting and with textures that may be described as transparent, waxy or shiny, iridescent, or with a sheen. The edges may be smooth, finely serrated, and wavy or crepe-like.

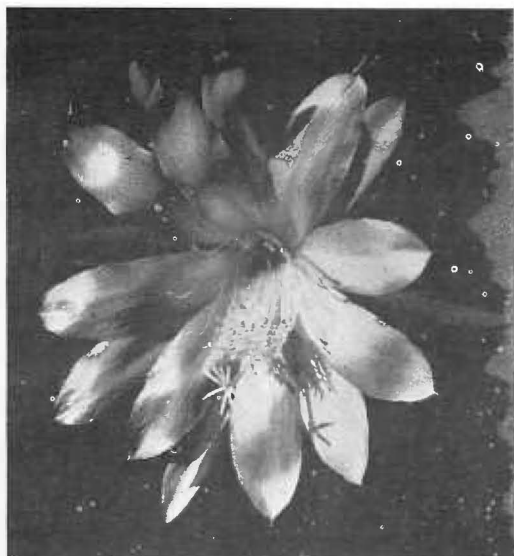


FIG. 31. Gloria shows the overlapping petals arranged in two rows.

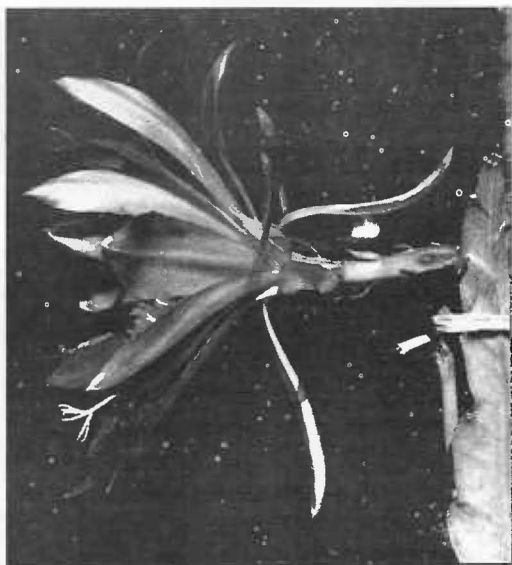


FIG. 32. The side view of Gloria. On warm days a flower may open wider than when it is cool.



FIG. 33. *Hermosissimus* has the loose arrangement of petals.



FIG. 34. Callender's Pfau has several rows of petals giving a double effect. Photographed in Beahm Gardens.



FIG. 35. Jules Schlumberger has ribbony petals. This plant is ideal for basket culture. Grown by Coolidge Rare Plant Gardens.



**Wheel-  
shaped**



**Over-  
lapping**



**Double**



**Single  
Loose**

FIG. 36. The arrangement of the inner petals may be summarized by the above sketch.

The petal *shapes* may be described with about five forms:

1. Narrow—almost linear as in Jules Schlumberger, or narrow-elliptic as in *E. strictum*.
2. Oblanceolate—narrow, tapering to a point as in Acker-mannii hybrid.
3. Obovate—oval with narrower base as in Argus.
4. Spatulate—spoon-shaped as in Callander's Pfau.
5. Elliptic—oblong with both ends narrowing down evenly as in Peacockii.

These shapes can be modified in the descriptions by saying widely or narrowly elliptic, etc. The end may be blunt, pointed,

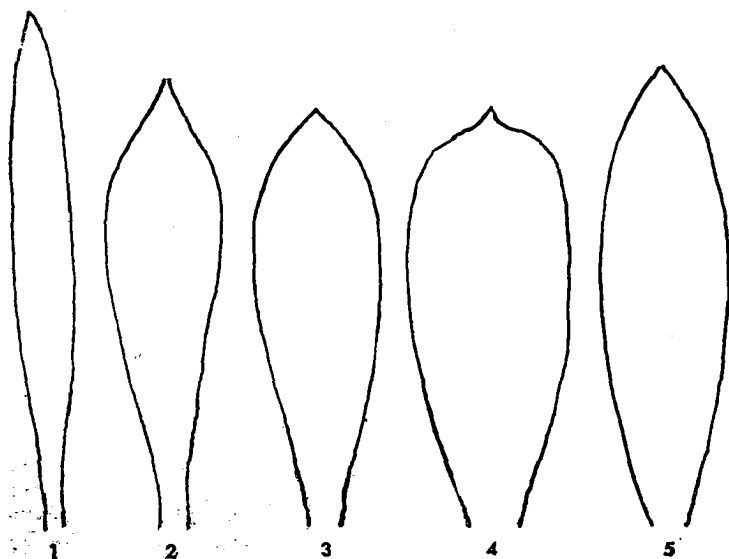


FIG. 37. Petal shapes: 1. Narrow, 2. Oblanceolate, 3. Obovate, 4. Spatulate, 5. Elliptic.



or bluntly rounded with pointed tip. The center vein may be prominent with the tip of the petal in-curved or out-curved. The same shapes and characteristics may also be used in describing the outer petals.

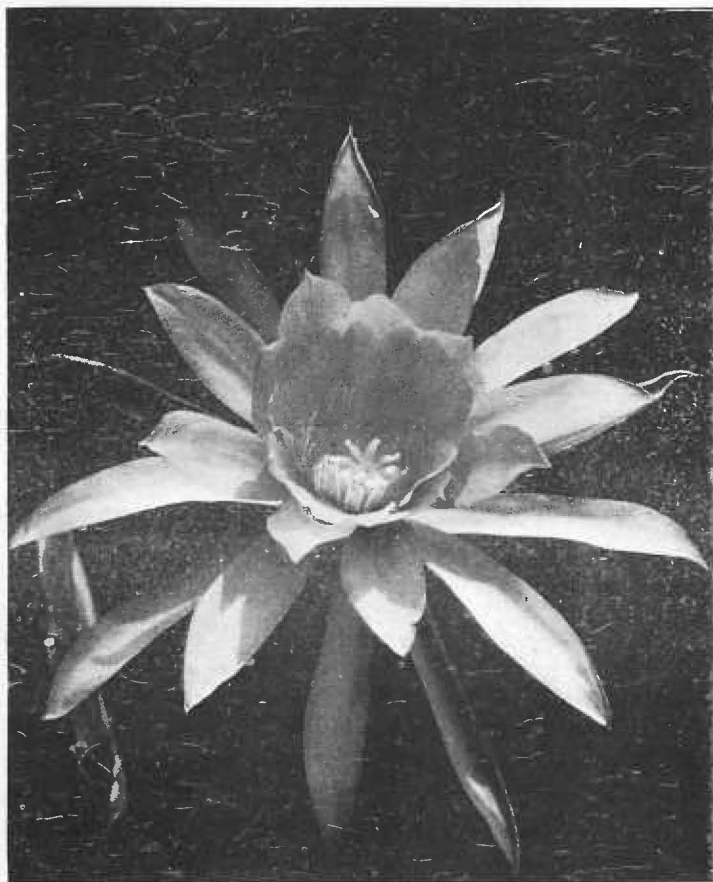


FIG. 38. The popular pink Padre has oblong petals. These are wider than in *E. strictum* (page 32) whose petals are narrow.

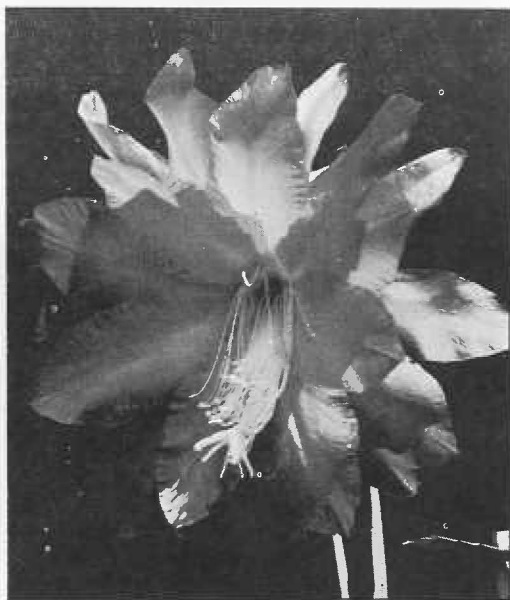


FIG. 39. Aristocrat has obovate petals. Note the crinkly or wavy edges that give this red flower a truly aristocratic appearance.

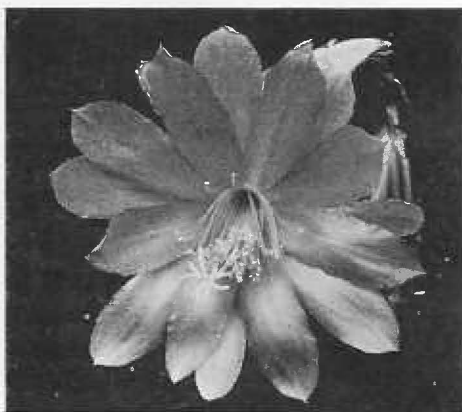


FIG. 40. The spatulate shape of petals may or may not have a pointed tip.



FIG. 41. Vive Rouge has a wide open flower with oblong petals. It is one of the most popular reds and produces many flowers, often at the expense of the plant.

The *color* markings may be:

1. Solid
2. Dominant
3. Mid-stripe
4. Center
5. Edges
6. Base
7. Throat
8. Other variations

Colors will be discussed in more detail in a separate chapter.

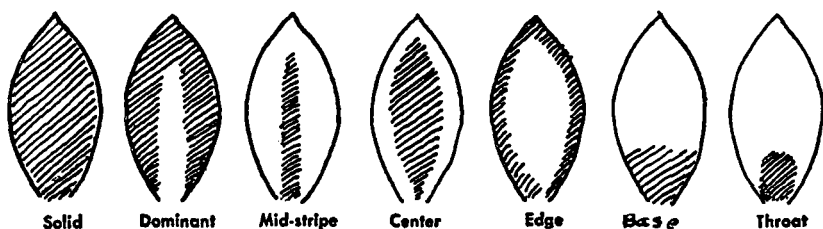


FIG. 42. The color markings are in many variations; the most common can be indicated as shown here.

### *Pistil*

Epiphyllum flowers are bi-sexual having both stamens and pistil in the same flower. The stamens are the male organs while the pistil is the female organ. The latter includes the style and stigmas.

The ovary has been explained as the seed-bearing organ surmounted by a hollow tube called the style. The end of the style is again divided into spreading stigma lobes. It is these stigma lobes that receive the pollen, and if it "takes," the embryo seeds become fertilized. The style varies in thickness and color, the latter being one of the distinguishing characters in determining the species. The stigma lobes are usually white or cream colored, sometimes purple; occasionally pink underneath. The number of stigma lobes vary in most varieties so that it is doubtful if a count is a deciding factor; some varieties have but few lobes (5) while others have many (14). Some are noticeably long (three-quarters inch) while most are shorter (one-quarter inch). Some stigmas remain closed until it is time for pollination to take place while most of them open with the flower. When the flower's pollen is ripe the stigmas secrete a sticky substance to hold the pollen and are then said to be receptive.

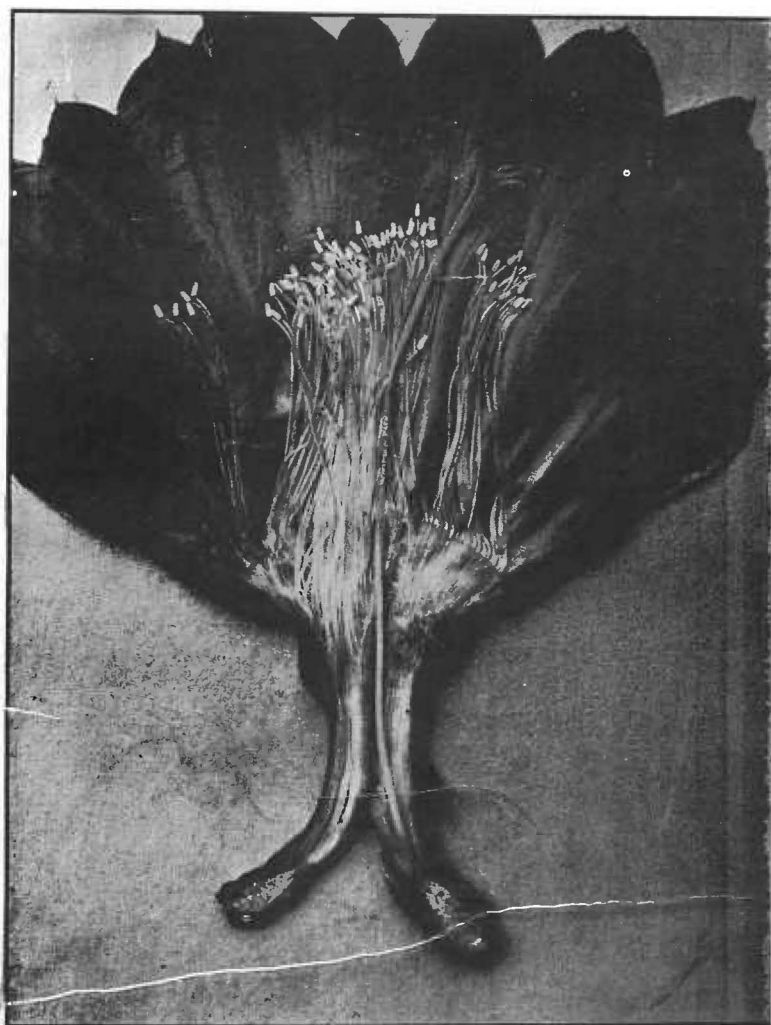


FIG. 43. A bisected flower showing the pistil which reaches to the ovary. Some of the stamens are attached at the throat in a definite rank while others are attached irregularly along the tube.



FIG. 44. Sun Goddess has a row of erect stamens as well as the cluster around the pistil.

### *Stamens*

The stamens include the thread-like filaments and the anthers. These are numerous so that visiting bees may be thoroughly dusted with pollen as they try to reach the nectar which is secreted at the base of the petals. They are attached to the tube, usually at two ranks—a row of shorter ones near the base of the petals and many more attached irregularly along the throat. They stand erect as in *E. strictum*; in an erect row surrounding the style with a heavier mass lying against the petals as in Callander's Pfau; or all may droop in a mass extending downward from the style usually in a graceful cascade as in *Peacockii*.

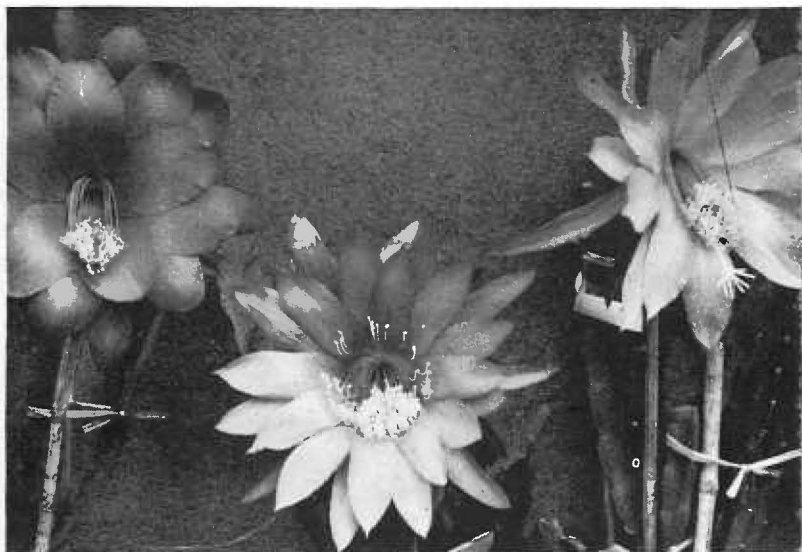


FIG. 45. Arrangement of stamens is shown in Tulip, Sunburst, and Loebneri.  
Photographed at the Beahm Gardens.

Filaments have a tendency to have the same colors, or a tint of the color, of the inner petals. At the point of attachment they are usually a light green and merge into color and then fade to white towards the anthers. The reflection of the color in the petals often gives the effect of colored filaments whereas they may be white.

The anthers which are attached to the ends of the filaments are receptacles on which the pollen grains are produced. When ripe and ready for dispersal, under a magnifying glass they appear to be round, watery globules and yet, in actuality they are dust-like when they are carried to the awaiting stigmas of another flower. Pollen is short lived and it must be readily dispersed before the stigmas of the flower have reached anthesis (the short period that the stigmas are receptive to pollen). Pollen can be preserved by refrigeration which aids in perfecting certain crosses that might otherwise flower at a time when no pollen is available.

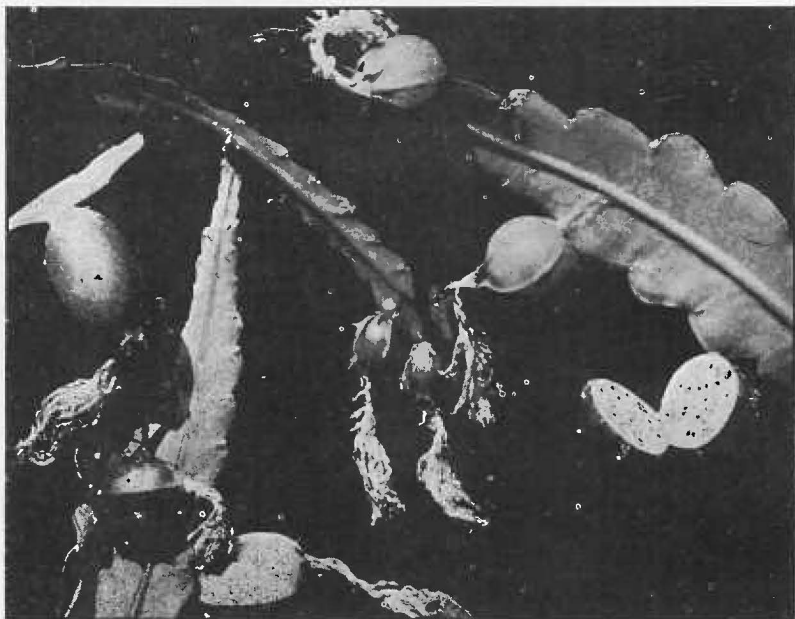


FIG. 46. Group of fruit of different shapes, some with bristles, all with scales.

#### FRUIT

Too little attention has been given the fruit of *Epiphyllums* and their hybrids. The fruit and seed are the last to change in evolution and they are therefore important in tracing parentage. There is but one fruit to an areole; it matures providing the seeds have been fertilized, otherwise the partially developed fruit will fall off. The attachment to the branch is by a woody connection that withstands strong winds; once a fruit is set it is held fast. Breaking off the fruit damages the areole and branch tissues; always cut them with a sharp knife. Unless you desire the fruit for their seeds it is better to remove them, otherwise the strength of the branch goes into the development of the fruit.



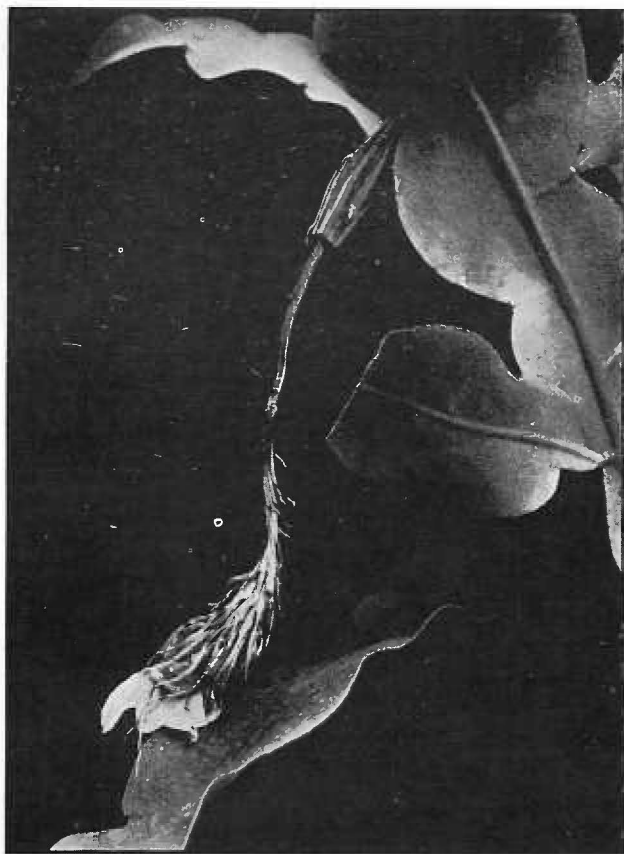


FIG. 47. The withered flower "persists" or remains attached to the fruit until it is ripe. The plant is *E. oxypetalum*.

The ovary, which becomes the fruit, is often heavy with scales and bristles in its juvenile state but it may drop its bristles and even its scales as the fruit ripens. The ridges often terminate in a scale or may continue from top to bottom. They are mostly of four shapes: round, oval, egg-shaped, and cylindrical.

Most of the true species are without spines and have few scales



FIG. 48. Round fruits. Tula, on the left, has heavy bristles; Agatha, center, is practically smooth with ridges terminating in scales; Kinchinjunga, right, has ridges extending the whole length of the fruit. Colors of the fruit are Magenta, Peach, and Rose Red, respectively. All  $\frac{3}{4}$  size.

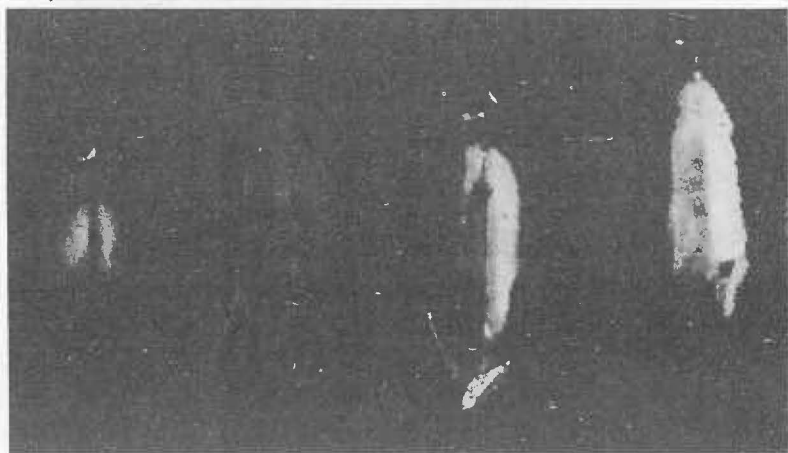


FIG. 49. Oval to cylindrical fruits in shades of Crimson. Left to right they are: Montezuma, Hermosus, Dante, and Hermosissimus. Photos taken at J. B. McNary's in Pasadena on November 1.

whereas the *Heliocereus* hybrids have many scales and bristles.

The surface may be smooth, furrowed, or ridged. The colors are greens, yellows, pinks and reds, to blackish purples. Ripening *Epiphyllum* fruit has a strong fragrance that permeates a sizeable lathhouse. Their flavor is not especially sweet but is penetrating and lasting, having a taste somewhat like red claret wine, guavas, or strawberries. Mrs. R. W. Kelly has made jelly from the fruit and Mrs. Cactus Pete uses them to preserve with pears. The color of the pulp is white or gray, to pink and carmine.



FIG. 50. Fruit of *Ackermannii* hybrid. The fruit of the wild species has never been described.

The skin is tough and the fruit often retains the dried flower until it dries, or decays and falls. The seeds are usually black, shiny, inversely ovoid and finely pitted. When the fruit is soft and ripe the seeds may be removed by squashing the pulp in a bowl of water. If a large quantity of seeds are to be removed, an egg-beater helps to break up the pulp from the seeds. The water can be strained off and the seed spread on a newspaper to dry. After drying, the seeds can be further cleaned by rubbing together to remove the dried film still surrounding them. The cleaned seeds should be stored in a ventilated jar away from insects and dampness. Moth balls or "Semesan" will preserve them from bugs.

# COLOR

## AS APPLIED TO ORCHID CACTI

The most important factor used to distinguish one *Epiphyllum* hybrid from another is color. Second in importance is the form of flower, and third, the shape of the branches. If color then, is such a dominant character, we have to form a practical language based on fact and theory. Much of the confusion in the hybrids is due to color names which are based on an individual's idea of colors; in most cases their terminology is far from the color names as set up in a standard system by artists or color technicians.

Before delving into theories of color let us analyze the flowers themselves to see what difficulties they present. First, the color of flowers of the same hybrid are never exactly alike due to the law of variation. The same plant may produce flowers lighter or darker or with slight variation in markings. The early flowers are sometimes richer in color than later ones, or they may be richer in color when they first open and fade or deepen as they age. The cultural conditions and temperatures add their influence to variations. Except in a sport, the colors or hues are sufficiently constant to be determined and recorded.

The next difficulty is in seeing a color in its true value. An *Epiphyllum ackermannii* flower in a shaded location appears deep and rich but in strong sunlight it is several shades lighter with an orange cast. Early morning light differs from the stronger light at midday. In the field, there is an ever-changing light condition that must be considered in describing color. Theoretically, color readings should be made by a window with north light and preferably towards the middle of the day. Color experts will agree within 95% of each other in determining colors while the layman may only average 75% in accord. Some people are color sensitive while others have no color accuracy.

The third difficulty is in comparing texture differences. One

cannot lay the petal of a flower beside a printed color sample and expect it to match. An impression is more accurately obtained by holding the flower at arm's length beside the color guide. All processes used for recording color will vary and each has its own weaknesses. For example color film is weak in pure reds and strong on purples. Films, exposures, and processing are never constant. Color prints are entirely unsatisfactory where the reds take on a brown cast. Silk-screen and lithographic processes are better adapted to record the strong and pure colors that we observe in Epiphyllums. Watercolor reproductions are weak and do not have the depth of color obtained with oil paints. Colored chalk and pastels can be built up to a satisfactory rendition. There is no exact or perfect reproduction process unless by oil painting which may be printed by the four-color process.

Color names have always been uncertain until recent years when several systems have been presented to the public for standardization. In 1912, Robert Ridgway published "Color Standards and Color Nomenclature" in an endeavor to standardize colors and their names. His aim was to remove the personal equation so that an agreement could be reached; for example "violet" and "purple" have been used interchangeably but in reality they are quite distinct. This system might be in use today if copies of his guide were available.

Of the present day systems and color charts in reference books, all have the same weakness—trying to record all colors of the spectrum by four-color process printing. It has not yet been done successfully and each reprinting is different so that the references by names or number have no value. The colors accepted as a guide must be the same yesterday, today and tomorrow. The idea of a spectrum with all the gradations and tones is commendable and can be referred to by numbered squares but unless the colors can be reproduced faithfully by some process it is of no value except in its original form.

A simplified inexpensive chart produced by Hiler has many commendable features. It consists of a circle of "oil-screen pro-

cess" swatches of the primary and intergrading colors; no tints are shown and it would therefore be difficult for the average gardener to use. We therefore recommend the more complete English guide "Horticultural Color Chart" published by the Royal Horticultural Society. This chart contains 200 plates consisting of 64 full hues and the balance in tints and shades.

This brings us to a brief discussion on color theory. Light and color are analogous, and without the former we would see no color. When sunlight is intercepted by a plant it is broken into many parts which are absorbed by branches, flowers, etc. Each texture absorbs only parts of the light and the light waves that bounce off, or are reflected, are the ones that produce the visual effect of color.

Sunlight is made up of a so-called spectrum containing infinite color varieties each having its own wave length. Many of these fine gradations are not seen with the eye but we can clearly distinguish three primary pigments which we will call yellow, blue, and red. All other blends are combinations of these three colors. We may therefore say that a flower is red because the blues and yellows are absorbed, leaving the red to bounce off to produce the mental sensation by which we recognize that color.

The *hue* is the term used to distinguish one color from another such as red, orange, magenta, etc., without qualification as to intensity. A lighter tone of any color is known as a *tint* while a darker tone is known as a *shade*. Each step in the color scale is a *tone* of that color and applies to the gradations between the hues. Mr. N. P. Brigante worked out a color chart that clearly showed that the colors of all *Epiphyllum* hybrids require only about half the spectrum. The flower colors range from magenta (red-dish-purple) through reds, orange, to yellow. We do not need the blues nor greens. This could be clearly demonstrated if an artist's color chart could be faithfully reproduced by the printing process.

The "Horticultural Color Chart" has endeavored to standardize color nomenclature so as to clarify the prevalent varying con-

ceptions of colors. For instance such names as mauve, salmon, amber, coral, orchid, scarlet, cinnabar, apricot, buff, copper, etc., have little meaning unless there is agreement or acceptance of a standard for each name. Descriptions of colors by number would detract from the interest in the fine gradations of color. For example, which gives you the better picture OR<sub>5</sub> or light orange-red?

Since the flowers themselves vary, not in sharp contrast as from a red to a magenta, but in tone (darker or lighter), we should be able to select a dozen or two basic hues. For instance starting with the "warm" colors (yellows through orange) we select a yellow (Lemon\*), orange-yellow (Apricot), yellowish orange (Tangerine Orange). Salmon and Peach follow, and then Orange and its deeper tone Indian Orange. The warm reds (on the orange side) are reddish orange (Poppy Red), and its deeper vermilion tone Dutch Vermilion.

The "cold" colors are towards the blue and start with Vermilion and show the first trace of reddish blue (Purple); this is followed by Scarlet and its deeper tones called Signal Red and Orient Red (the latter being the deep rich color of the hybrid Vive Rouge).

Between Scarlet and Crimson are many of the rose tones which are lighter tints of these colors containing very little purple. Blood Red is a deep color with very little purple and when reduced in strength becomes Porcelain Rose. Carmine and Crimson are quite similar and are not as deep a red as is generally believed. Cherry and its deeper tone, Cardinal Red, are followed by Tyrian Rose which approaches Magenta (violet-red).

Pink, rose, and light purple are intergrading, being tints of stronger colors which are mixtures of reds and purples. Some of these light colors are toned down with gray so that the range is almost endless and harder to distinguish with exact names than are the stronger colors. We might select Neyron Rose, Rose Red

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\*Color names written with a capital letter indicate accepted names used in a color chart now being tested this flowering season.



with its tints and shades, the bright Phlox Pink, and Solferino Purple.

Magenta is a true violet-red and predominates in many of the hybrids; its tints are Rhodamine Pink and Fuchsine Pink and its deeper shade is Tyrian Purple.

Blue is not used in flower descriptions of *Epiphyllum* hybrids, the purple containing the most blue is Rhodamine and *Dianthus* Purple. Orchid is misleading and generally refers to light purple.

The so-called Autumn shades such as amber, copper, buff, etc., are grayed colors and the most difficult to describe. However, by eliminating many of the general terms and accepting a few basic, named tints and shades we may be able to describe the color of a hybrid so that it will convey real meaning.

When more copies of the "Horticultural Color Chart" are available, one may match flower colors with the 200 charts for exact records but for quick reference work and for general descriptions we must use a simpler system. For instance if we determine the color which we will call "orange" we can qualify this color by saying "red-orange" or "yellow-orange." Then too, we can further qualify it as deep or light, clear or gray.

During the next flowering season, with the co-operation of the *Epiphyllum* Society, we will select a few of the colors that may be used for basic descriptions and as the need arises more can be added. It is better to use a few color names correctly than self-coined terms that cause confusion to collectors and dissatisfaction with customers.



FIG. 51. Padre is at home, growing in pockets of palm branches in California.



FIG. 52. The wild *Epiphyllums* grow in trees with other tropical plants.

## CULTURE

To understand the culture of *Epiphyllums* one must know how they grow in Central America, on the northern coast of South America, near the Amazon River, in Paraguay, or in the tropical districts of Mexico. They are generally found growing as epiphytes in jungle trees. They grow in the forks of branches, upon dead remains of vegetation in company with orchids, bromeliads, ferns, and mosses. Unlike parasites, they never derive their nourishment from the trees but from the deposits of humus lodged in the fissures of the bark. *Epiphyllums* thrive in this highly nitrogeneous humus.

The branches of these tree-loving plants hang pendant from the trees. Displaced plants also grow on rocks, where they send their roots deeply into the crevices filled with earth. Twilight prevails in these immense forests. In the rainy season the drops

of water fall incessantly from leaf to leaf. The extreme warmth expedites the evaporation from the soil. Occasionally too, a humidity prevails of which we have no conception. How can the fact be explained that such a succulent plant as the *cactus* can thrive in this kind of atmosphere without rotting?

First of all, in the natural environment, the water naturally runs off from these plants growing on the tree-trunks and branches, and in the rocks, so that actually the roots are not injured by excessive moisture. Were they to grow upon the forest floor, they would rot quickly. Therefore they are always found growing at a certain height, where the dampness is quickly dispelled by the currents of air.

Because of these life habits, the roots of *Epiphyllums* cannot endure a persistent wetness, while a temporary drenching suits them perfectly. The main root anchors the plant securely to the branch while the fibrous roots conduct the food. Even with the customary wet and dry seasons of the tropics the roots never become perfectly dry otherwise a dry rot would loosen their attachment to the tree. The air roots are necessary in their habitat while in cultivation the extra nourishment is supplied. If we wished to simulate the natural growth of *Epiphyllums* exactly, we would be required to fasten the pot in such a manner that an open side would be directed sideways and the whole plant allowed to rest on a tree trunk covered with bark. Thus, the air-roots would find nourishment in the bark substance of this trunk.

Fortunately, the parents of many of the hybrids are terrestrial and impart to their offspring the hardiness of a less epiphytic plant. This is one of the advantages that the hybrids have over the true species but unless you know the parentage, it is best to treat them as you would those coming from the tropical jungles.

If you are a beginner you may profit by this advice. Do not take a cutting or a plant and pot it in any old soil with the thought, "I will repot it tomorrow and I'll remember its name and where it came from." So many growers have lost their plants or their names by this slipshod method. If you appreciate *Epi-*

phyllums, plant them properly, keep their names, and learn all you can about them. They are deserving and will reward you for your care.

### *Soil and Fertilizers*

Because the root system is limited, a rich soil is necessary to give them the required amount of nourishment. A semi-acid soil rich in nitrogen, such as is used for begonias, approximates that of its habitat. It will be noted that this soil composition is in direct contrast to that recommended for desert cacti which require a "sweet" or non-acid soil rich in lime. Never use lime for Ephyllums.

It is interesting to note the various recommended soil mixtures but when they are compared it will be seen that they are all quite similar. By slight variations for different localities, good results may be gained for an individual grower. Soils, fertilizers, and leafmold differ but with judgment and a little experimentation the proper mixture may be found.

The late Dr. R. W. Poindexter found the following mixture to be most satisfactory after years of experimenting in his nursery and by individual growers:

- |                             |                             |
|-----------------------------|-----------------------------|
| 4 parts leafmold            | 2 parts gravel              |
| 2 parts German peat moss    | 2 parts sharp (washed) sand |
| 3 parts cow or sheep manure |                             |

The leafmold is the most important ingredient. Granulated or lump charcoal is a valuable addition to the mixture.

European mixture recommended by Dr. Werdermann:

- 1 part leafmold
- 1 part manure
- $\frac{1}{2}$  part sand

W. O. Rother of Germany found this the best soil mixture after forty years experience:

- |   |                               |
|---|-------------------------------|
| $\frac{1}{8}$ crushed old plaster-lime from walls | $\frac{1}{8}$ old mellow loam |
| $\frac{1}{2}$ well rotted cow manure earth        | $\frac{1}{4}$ coarse sand     |

This latter may be prepared in the following manner: the fresh cow manure is arranged in layers with an equal portion of loam, a layer of manure upon a layer of loam. Cover the pile with a covering so that the rain cannot leach out the manure-earth. After approximately three months turn the pile over and repeat the process several times. After a half year the earth is ready to be used.

Ventura Epiphyllum Garden recommends this mixture:

3 parts well decomposed leafmold

1 part coarse sand or decomposed granite

1 part peatmoss

1 part *well rotted* manure or  $\frac{1}{2}$  cup steamed bone meal to 5 gallons of mixture.

Peat moss is optional. In its place pea gravel may be added for drainage. It would be beneficial in high temperature regions, as it would help hold the moisture. The plants must have good drainage at all times.

Cactus Pete has ceased to recommend the use of manure and moss in the mixture because as he says, "Every grower has his own formula but we find that the seemingly perfect conditions for the commercial grower are the stumbling blocks for beginners. For instance, too much peatmoss encourages an over-acid soil and root rot, while fertilizer in varying stages of decomposition and strength encourages diseases. We recommend the following basic mixture which can be varied with the grower's experience:"

1 part good top soil

1 part decomposed leafmold

1 part coarse builder's sand

Generous addition of charcoal or charred wood (not ashes)

John Baumgartner, private grower with a fine collection, suggests:

$\frac{1}{3}$  rotted oak leafmold (at least one year old)

$\frac{1}{3}$  rotted steer manure

$\frac{1}{3}$  decomposed granite

To each  $\frac{1}{3}$  cubic yard of this mixture add 2 cups sulphate of potash and 5 pounds steamed bonemeal. Add coarse charcoal equivalent to one-tenth of the total bulk.

Coolidge Rare Plant Gardens use:

$\frac{4}{5}$  well rotted oak leafmold

$\frac{1}{5}$  rotted cow manure

In February add a one-inch dressing of rotted manure.

At monthly intervals starting in June give three feedings of commercial fertilizer.

Our best known German grower and hybridizer, Knebel, recommends:

1 part leafmold

1 part old crumbly loam

1 part peatmoss

1 part well rotted manure

1 part river sand

The ingredients need not be finely sifted, so that the soil will retain a lighter texture. Lime is not to be used in the soil.

We may summarize that the most popular mixture is:

1 part good garden soil

2 parts leafmold

1 part well rotted manure

1 part coarse gravel

Sand has been excluded because of the tendency to use it too fine which results in caking the soil or forming a smothering layer around the plant. Never use beach sand. Sharp gravel about the size of a pea is recommended and in conjunction with leafmold will keep the soil well drained and aerated. Top soil, loam, or garden soil is the darkest soil in your garden, usually rich, friable, and free from sand.

Leafmold can be purchased from a seed store or is found beneath trees where leaves have rotted and formed a fine black powder. Most of the commercial leafmold is only partly decayed and serves to keep the soil loose until it becomes sufficiently rotted for food. Be careful that this does not act as a host for mealybugs.

These soil mixtures are sometimes sterilized at 300° F. as a safeguard against nematodes or other insects. It should be moistened and heated at this temperature for one hour.

Additional amounts of fertilizer, such as liquid manure or the various commercial fertilizers containing potash and phosphate as well as nitrogen, can be used with advantage after the buds are set and during the growing season after flowering has taken place.

The soil in which we cultivate *Epiphyllums* must therefore be extremely permeable, air-containing, nourishing, but not heavy. In the choice of soil, one should bear in mind that many hybrids are a result of crossing with *Heliocereus speciosus*, which is not an epiphyte as are most of the true species of *Epiphyllum*. If they are planted, as so often happens, in more or less predominantly pure vegetable mold, they will develop weaker growth than with a somewhat more solid soil composition.

Success depends in no measure on the exact observance of a definite ingredient formula. In default of other ingredients, any good nourishing, not too heavy, loose and permeable garden soil can be substituted.

### *Potting and Marking*

There have been debates as to the use of clay pots, glazed pots and tin cans. There is little doubt that collections in clay pots require more attention than those in containers less porous. In California we have seen fine collections grown in pots but tests between these and can-grown plants have proven the latter produce more flowers and larger plants. We might compromise by saying that *Epiphyllums* grown in the cooler climates require



clay pots for a quicker evaporation of moisture while in the dryer climates tin cans are more advantageous.

Tin cans may be dipped in hot tar but this is a hazardous undertaking for the inexperienced. Roofing tar, thinned with gasoline, may be used as a substitute, although it is less durable than the hot tar.

The semi-acid soil for *Epiphyllums* must be cool and moist (neither soggy nor dry). It is difficult to keep the soil in clay pots from drying out. Flower sizes and colors are below standard if the soil lacks sufficient moisture for food assimilation. The hybrid *Gloria*, for instance, is much richer in color and larger in size when it has sufficient moisture.

Soil has less tendency to pack in tin cans and one of the chief requirements of *Epiphyllums* is a loose porous soil. Sizeable holes must be punched in the sides of the cans to allow for drainage and circulation of air. Holes in the *sides* of the cans are less likely to harbor pests than if made in the bottom. Glazed pots and wooden containers have their good points, but the latter rot very fast unless heavily painted or lined with tin.

In the bottom of each pot place a layer of coarse gravel or broken pots. Hold the plant being potted, suspended in proper position in the pot and fill in around with the potting soil. Press firmly without breaking the roots.

When to repot is a difficult question. A plant that is pot-bound (roots fill the pot) must be placed in a larger container or growth will cease. Select the next sized pot rather than a large one since *Epiphyllums* flower better if the roots are somewhat crowded. Too large a pot also has a tendency to retain too much moisture.

If a plant stops growing while others are making growth, a repotting will probably be beneficial. Without disturbing the roots replace in the next sized pot for best blooms. Withhold water altogether for a week, then water sparingly until the plant is established.

*Epiphyllums* may be transplanted any time during the summer, however, as a rule most transplanting is done about a month



FIG. 53. Otto Siepke growing in a  $2\frac{1}{2}$  in. pot. A small pot forces early flowers but they are somewhat stunted.

after flowering. This allows the plant to rest before making late summer growth. Transplanting as late as September, after the new growth is made, will prevent the late growths from ripening. Late cuttings have a tendency to force the formation of buds instead of new growth and late transplanting is not to be encouraged. In very hot summers the main growth will often be considerably retarded so that by transplanting in September there is danger of its discontinuance. However, if one waits for the natural conclusion of growth it may be too late to transplant

because the plants will not have established themselves by winter.

Young plants should be repotted each year until after three or four years they are ready for a ten-inch pot. With proper fertilizing they can then remain in this same pot for two or more years. *Epiphyllums* seem to like a cramped root system.

Potted plants must be fed or they will starve for want of sufficient food. A reasonable amount of top dressing should be applied before and during the flowering season—April through July. Well-rotted cow, goat, or rabbit manure is recommended. The liquid fertilizers may be used according to directions. Blood-meal and bonemeal may be used *sparingly* in place of the top dressing as part of a balanced diet.

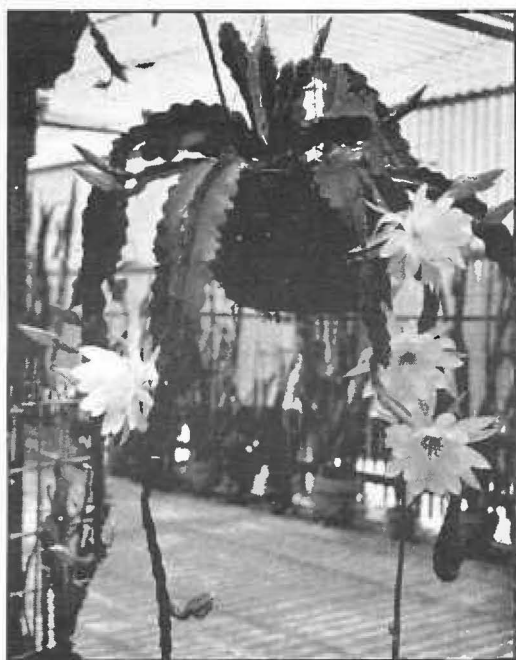


FIG. 54. Eden with its white flowers makes an attractive hanging basket. Grown by Coolidge Gardens in their "Jewelled Corridor."

Hanging pots and baskets lend themselves to the habit of many of the plants with drooping branches. In fact most of the Epiphyllums in their native habitat hang from trees, where they attain a length of six feet and even more.

Containers for basket plantings may be constructed in several ways. Small one-inch redwood slats may be used to construct a box, log-house style. Wire baskets are available from seed supply

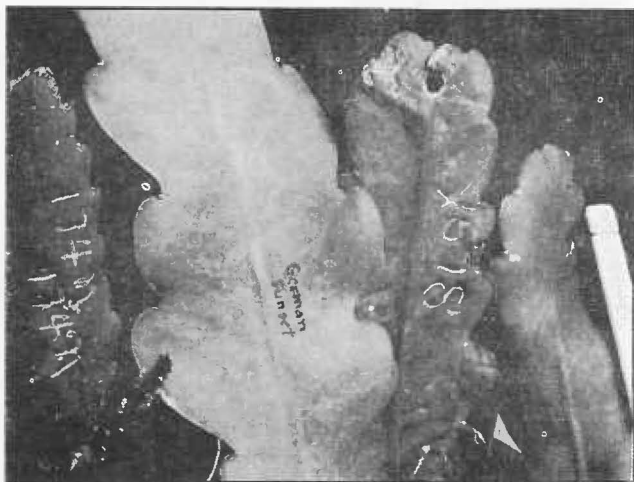


FIG. 55. Identification scratched with a pin defaces the plant. "German Sunset" is written in India ink and lasts about a year.

houses at moderate prices; these are hung in the shaded glass or lathhouse, on the porch, or suspended from arbor or trees. The baskets are lined with a layer of pressed spagnum moss and then filled with a soil mixture of leafmold, fertilizer, top soil, and with moss used as a binder.

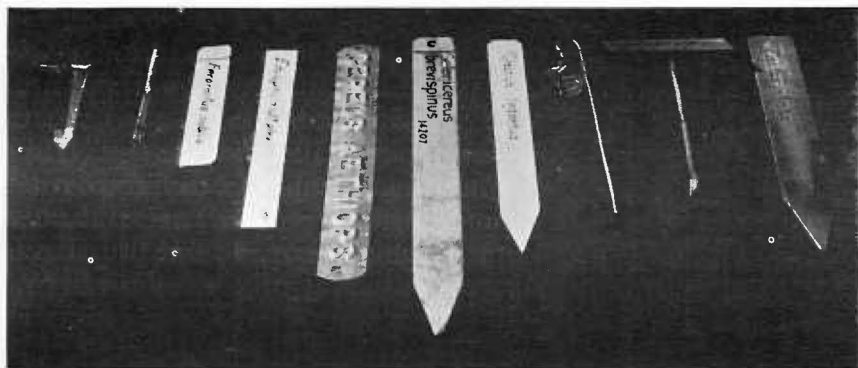
In 1837 English plantsmen were growing Epiphyllums in suspended balls of spagnum moss. Perhaps they got their idea from the South American ants that construct mud balls in jungle trees

and then sow seeds of epiphytes and other tropical plants to act as binders as their roots penetrate the mass; the plants thus shed the rains. Before long this hanging ants' nest bursts into bloom with a strange assortment of tropical flowers.

Basket plantings must have supplemental food of, preferably, liquid fertilizer every two weeks during the growing season in addition to top dressing twice a year.

Plantings in the decaying pockets of palm branches are successful in the warmer climates. The shade of the palm and the moist pockets closely approach the habitat conditions of *Epiphyllums*. The other extreme is a report of plants successfully grown in osmund (species of fern) only, and also in ordinary garden soil—all with good results. Where can you find a plant more versatile?

Markers are important. As years go by you may wish to recall the name of the plant or where it was obtained. If you desire to add interest to your collection, acquire only plants with authentic names and mark them with permanent tags.



Various kinds of plant markers: 1. Painted sheet metal on which water-proof ink is used. 2. Glass tubing—name written with permanent drawing ink on paper sealed inside. 3. Wooden tag painted white with wires for attaching to plant. 4. Celluloid with lettering in water-proof ink. 5. Embossed aluminum made on a special machine, lasts forever. 6. Painted wooden stake with water-proof paint for lettering. 7. Common wooden plant marker stocked at all garden supply houses either plain or painted white to make a smoother surface for lettering. 8. Metal tag with embossed number. 9. Painted zinc strip, soldered to telephone wire. 10. Un-painted zinc tag with lettering in acid ink.

A temporary identification may be made by writing the name with India ink on the branch. The danger is in not replacing this in a more permanent form before the name becomes obliterated. Some growers scratch the name or an identification number with a pin on the branch. This mars the plant but identifies it for one or more years.

Wooden markers are more commonly used but these are often misplaced, or rot off, or the name becomes undiscernable. Such markers must be replaced periodically.

Wire tags may be attached to the plant by piercing the branch with a wire and then tying. This leaves a hole in the branch where rot is often introduced around the puncture.

Waterproof, die cut cardboard bands similar to the leg-band markers used on chickens are quite successful. They will not deface the plants nor become easily mixed nor undiscernable. These are ideal especially for commercial growers who can attach them directly to cuttings as they are made. Do not depend on them for more than a year.

There are several patented markers offered for sale, each with its own merits. However, every system must be carefully watched or names will be lost or tags confused. Mark your plants plainly and check them once a year while the names are still visible. Keep an indexed notebook in which to record the source or parentage of the plant, its flowering period, cultural needs, and descriptions of flowers, fruit, etc.

### *Watering and Spraying*

We have seen that Epiphyllums growing in the wild, in the branches of jungle trees are perfectly drained. They are adapted to withstand frequent rains and all excess moisture quickly drains away so that the pockets of soil never become soggy. Because of their position and the permeability of the root system, air circulates freely, yet the humidity of the jungle prevents a complete drying out at any time.

The location of the plants in cultivation, the season, and the

weather, determine the amount of water necessary. When the plants begin to grow in the early spring (usually February and March), start watering gradually and increase with the warm weather and the amount of growth produced. It is better to soak the entire soil thoroughly and less often than to apply only enough water to penetrate the upper surface.

After the buds have set, the plants require plenty of water in order for the flowers to properly mature. House plants may be watered twice a week while those outside require daily watering especially on warm days. Hold off watering on cloudy days except enough to maintain steady growth.

A fine spraying of the branches removes the dust and better simulates the conditions of the plant's humid jungle home. This spraying seems to benefit the developing flowers and helps to prevent the plant (especially the Christmas Cactus) from dropping its buds. Spray in the afternoon when there is no sun on the plants.

After flowering, which usually occurs during April, May, and June, the plants make their fall growth before becoming dormant. Some tend to become dormant soon after flowering and should not be forced by excessive watering. Watch the plant and you can soon tell the amount of water it requires. There is always a tendency to over-water which fact causes a stagnant soil, root rot, and thin withered branches.

A resting period is required for a good crop of flowers. Some growers recommend partial drying off, either immediately after flowering or in the late fall. Some prefer to keep their plants growing and allow the normal cooler months to invoke a natural rest. The roots should never be allowed to become perfectly dry or they will decay. Most of the collections in California submit to all of the winter rains.

After flowering, the plants normally seek a rest for a few weeks until finally the main growth begins. This will develop best with not too much warmth—that is, protection against extreme sunshine and heat. Supply good ventilation and regular

waterings during the hottest months until in October when growth stops and the fruits ripen. Then winter rest begins, during which time the plants should be kept barely moist yet not completely dry, until with the appearance of the buds in February, a new year-cycle begins.

Certain plants become shriveled after flowering, but there is no reason for alarm. Such a weakened plant needs careful nursing. Give it a shady location and very little moisture. After three weeks of this treatment transplant if necessary. Bring it to its earlier location and it will quickly regain its strength. *E. ackermannii* and *Nopalxochia phyllanthoides* and their hybrids suffer least after flowering. It is noted that small flower types are less drain on the plant than those with large flowers, also that plants with delicately shaded flowers are less robust.

Some amateurs make the mistake of forcing growth the year around which results in but few flowers. The fall growth must ripen in order to bear flowers the next spring. While dormant, for at least six weeks in December and January, put the plants in a cool place (35° to 45°) and barely keep the roots moist. Some growers, in cold climates, store their plants in a basement absolutely dry all winter without harm to them.

Remember that *Epiphyllums* must have ample moisture but never soggy soil.

#### *Air and Sun*

The oldest cacti were believed to be jungle plants or inhabitants of tropical forests. In the struggle for survival they became overshadowed by tree growth and found it necessary to climb into trees to seek sunlight where they depended on pockets of leaf-mold for their sustenance.

Although *Epiphyllums* are shade loving plants they will not thrive and flower without some sunshine. The moving foliage of tropical trees gives these plants the alternate sun and shade suited to them. In cultivation they cannot endure long periods of direct sun or they will turn yellow and cease to grow. On the other hand too much or prolonged shade causes a tender plant,



often with colorless, elongated growth (called etiolation).

Nevertheless, they make ideal house plants and a generous collection may be housed in east, west, or south windows of a home. Usually this is their winter location. The room should not be too warm during their dormant period in December and January. They should be kept on the dry side until spring growth appears, when, with increasing temperatures and more liberal watering, they will be in condition for the summer porch location, under trees or arbor, in the greenhouse, or under lath shelter.

In some localities plants must remain indoors the year around, where they flower, whether in Maine or in Alaska. They should be turned periodically so that every part of the plant will receive its share of sunshine. As the weather becomes warmer the windows should be opened to provide plenty of fresh air. After buds are set, the plant may be left in the same position, otherwise the buds are likely to drop off or the flower will be abnormal in its effort to turn toward the stronger light. The branches of house plants welcome frequent spraying.

In cooler climates, the plants must remain inside from Septem-

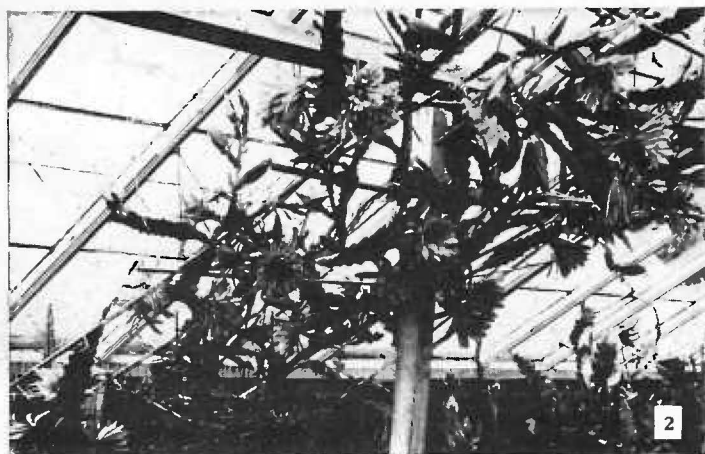


FIG. 57. If grown in a glasshouse they must be protected against sunburn.

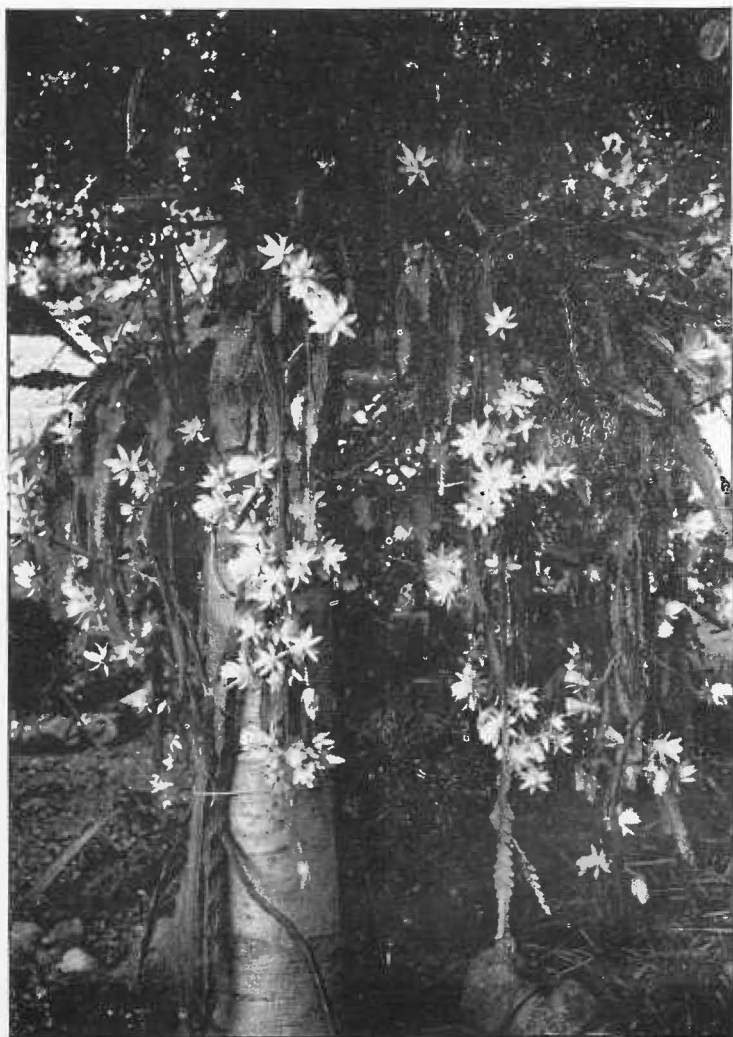


FIG. 58. Empress (Deutsche Kaiserin) responds to its outdoor life. The hanging basket was photographed June 10 in the garden of C. J. McCourt in Altadena, California.



FIG. 59. Blaue Flamme is well adapted to lathhouse culture at the gardens of Cactus Pete, Los Angeles, California.

ber to May. Sometimes to prevent too much growth at the expense of flowers, the tips of the branches are clipped (called "topping") in order to force the growth of flower buds that form during the winter.

In February the fresh tops denote that growth is beginning. The areoles seem more life-like and the whole plant assumes a

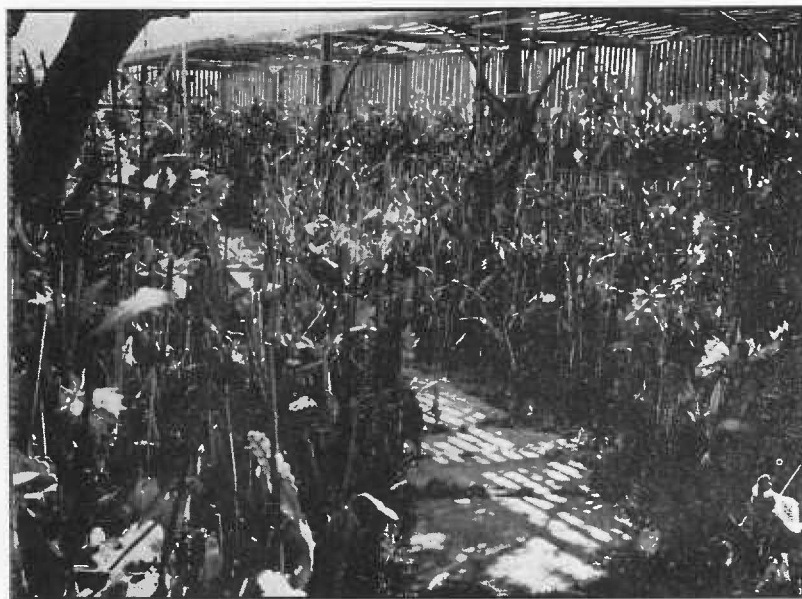


FIG. 60. The close, jungle-like association of plants helps to conserve moisture in Theresa Monmonier's Ventura Epiphyllum Gardens.

fresh appearance. The buds that formed in the areoles during the winter begin to develop in March. Where conditions permit, the plants should be moved outdoors or to their summer location as soon as the danger of frost is over. In the cooler zones this is probably in May. The point to remember is to avoid moving them *while* the buds are forming. Once the buds are set the plants may be moved. It has been demonstrated that plants will continue to flower when moved from the porch to an indoor location, from a lathhouse to an exhibition, or even from a ground planting to a pot. Of course they will flower better if they are not moved at all, yet their adaptability along these lines is surprising.

Grape arbors and trees without too dense foliage make ideal summer homes for Epiphyllums, but they must be protected from



FIG. 61. Birds chose the swaying basket for their home in the garden of R. W. Kelly. Note the two young birds.

wind and prolonged rains. Rain and shade shelter can be made of sections of woven jute fiber which can be removed to let in the late summer sun. During the hot days this matting holds the humidity of the spraying so that the conditions of a humid jungle

are somewhat simulated. In some localities plants may remain outside until October.

The various hybrids show considerable range in hardiness depending on their parentage. The true species are all quite tender with the exception of *E. crenatum* and *E. strictum* which are moderately hardy. The magnificent hybrids resulting from crosses with *E. crenatum* and *Heliocereus speciosus* are even hardier. Hybrids derived from *Nopalxochia* are also hardy. In the warmer climates of Southern California and the Southeast, Epiphyllums survive most winters with lathhouse protection where temperatures fall to 32° F. Many plants when quite dry have stood 28° F.

Hail storms are very damaging to these plants and the resultant scars spoil the appearance for years or until the old growth is replaced with new.

It has been found that these plants do not prefer glasshouse care as much as half-shade outdoors. They will not tolerate a burning sun and must have protection from hard wind. They require warmth, plenty of air, and sufficient water during the growing season.

The requirements as to the amount of sun vary with the different hybrids and they should be studied in order to meet their demands.

### *Tying-Up and Training*

A cutting should always be staked up while it is rooting, otherwise it must necessarily be planted too deeply in the soil. As soon as the cutting has established firm roots the stake may be removed, allowing a natural growth. Epiphyllums are naturally pendulous in their growing habit and are at home as hanging plants. Most growers do not have space for many hanging baskets and must stake up their plants for economy in space.

Thin bamboo stakes are best for utility and attractiveness. They are available in various lengths and usually stained green. When bamboo is not available, wooden flower stakes one-half to one inch square are suitable if they are painted to keep them from

rotting off. Do not dip them in creosote as a preservative because this oily substance is injurious; in fact creosote treated benches in a glasshouse will burn the plants and years are required to remove the damaging effects. Roofing tar thinned with gasoline may be used as a paint for wood preservative.

Select pot stakes about the same length as the branches. They may be stuck around the rim of the pot or directly next to the base of the plant. One stake may be used for a single branch or

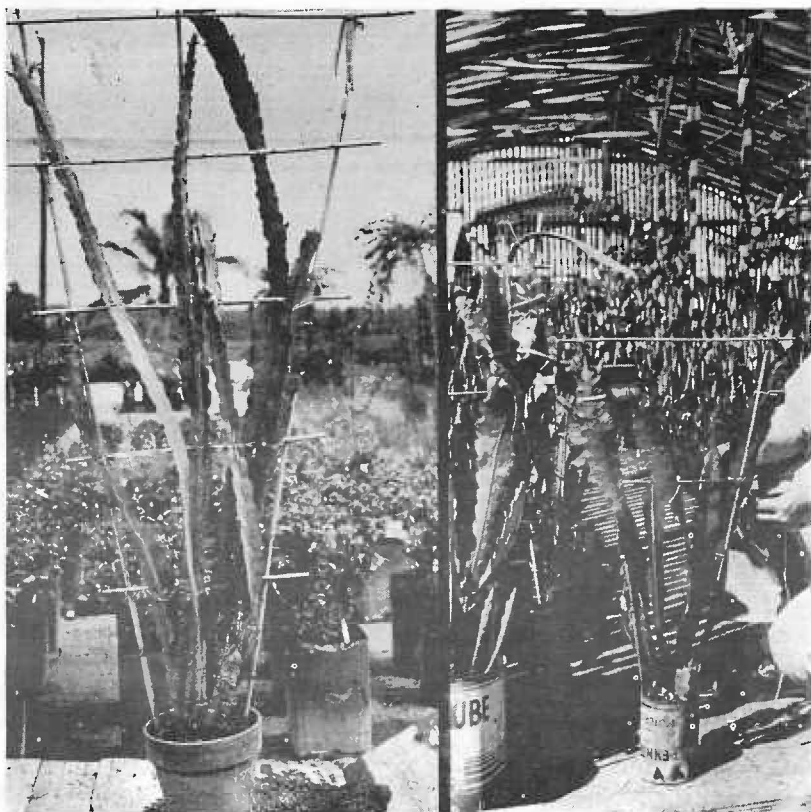


FIG. 62. Raffia is used to tie the bamboo trellis together. Note the drainage holes in the can on the right.



FIG. 63. A grafted Conway's Giant is supported by a wooden trellis in Mr. Black's garden in Hollywood, California.

two or three stakes placed around the edge of the pot of a bushy plant so that a cord tied around them will pull the branches in together.

Raffia, the fiber of a palm, is stocked in most plant stores and is ideal for tying plants. This material can be tied more securely with smaller knots than with cord. The coarse pieces of several strands do not cut into the soft growth nor do they contract and expand with moisture as is the case with cotton or hemp cord. The patented "Tie-ups" are ideal for branch ties because they are flattened, and wire reinforced. These green bands are inconspicuous and ideal if the plant is to be photographed. Heavy green yarn or cord can also be used for show plants.

Care should be taken not to confine the growth unnecessarily. For storage in the fall the entire plant may be drawn together by tightening a cord around the whole plant. If care is taken during



the growing season in tying up the new branches, so that the main central growth does not stand outward, strong well-shaped plants will result.

Although the basket-shaped growth is more natural, large specimens may be trained flat against a fan-shaped trellis. For exhibition plants with many flowers this method is most practical. Smaller plants may be trained espalier-fashion on a 2-foot trellis for specimens in a 6-inch pot, a 5-foot trellis for an 8-inch pot, and a 7-foot one for a 10-inch pot. Proper training and tying of the branches will give support to the heavy flowers so



FIG. 64. A seven-foot *Hermosissimus* is well trained to display its flowers in Coolidge's muslin covered "Jewelled Corridor."

they will neither droop nor be hidden in the foliage.

Some growers say, "Why should I crucify my plants by tying them to ugly artificial stakes and ladders?" We may answer with another question, "How can I grow my large 6 or 8-foot specimens as a pendant plant?" Mrs. Jaycolyn Emmons grows her large *Epiphyllums* in wooden boxes like the Europeans who grew

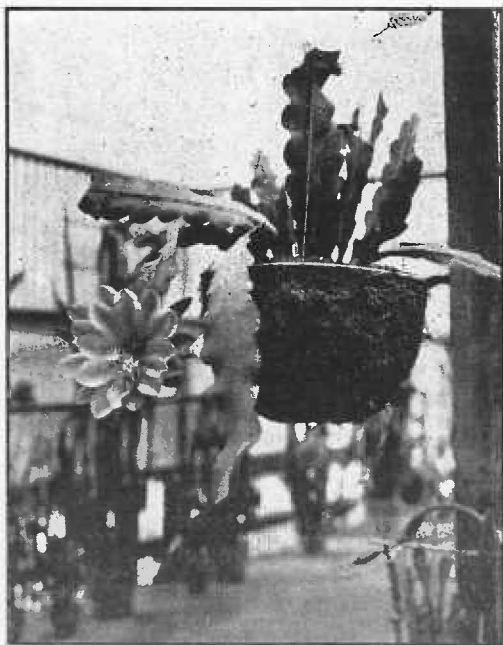


FIG. 65. Frau Stanke Stozier is a well grown basket type at Coolidge Rare Plant Gardens in Pasadena, California.

their 50-year-old specimens in huge tubs. Mrs. Emmons' square boxes flare at the top on a slight angle with a  $1\frac{1}{2} \times \frac{3}{4}$ -in. upright strip nailed to opposite sides. Holes are bored every 8 inches in the whole length of the strips through which binder's twine is laced back and forth. The individual branches are then tied

to this twine with the result of a good support against the wind for 60 or 70 flowers.

Unless one has very old plants, pruning or cutting back is not necessary. Healthy branches will produce flowers for several years. Old growth should not be removed until the areoles look dead or lifeless. After a branch has finished growing and flowering it is better to remove it to make room for new growth. On most plants this old growth is removed near the base, whereas on those having lateral branches such as the hybrid *Cooperi* and *Epiphyllum oxypetalum* these side branches are cut off at the point of union with the main one.

A better shaped plant may be obtained if the branches are pinched back, that is, the tips cut off with the finger nails. This method can also be used to stop the growth of an awkward branch, thus hastening its maturity and thereby diverting the strength into the flowers.

Poor, weak growth often results during the winter rest and these long, round, thin, or light colored branches should be removed in the spring. Poor light, too much warmth, or crowded stems, cause etiolation or spindly branches that never produce healthy growth or flowers. Do not remove these shoots as fast as they appear or they will send out even more. Wait until early March and remove them all at one time and they will soon be replaced by healthy summer growth.

A bushy plant is attractive but a small root system will support only a limited number of branches and the excessive ones may wither and dry back. Most of us make so many cuttings from our plants that we have little danger of too large a plant. In making cuttings be sure the knife or cutters does not *crush* the branch. Make a smooth clean cut. Flowers, too, should always be *cut* and not twisted off.

Most of the pruning is recommended by Europeans where huge specimens of *E. ackermannii* have been grown for many years. Their policy is to remove some of the older growth so that the plant will not get too large yet make room for continuous

new growth from which flowers will appear the second year. In other words, they feel that a branch is good for two flowering seasons. In the U. S. A., we believe that branches will produce for years if the plant is kept growing and the areoles are not injured by pulling off the flowers.

### *Culture Experiments*

Plant growth can be changed by the application of certain chemicals to seeds or directly to the growing area. X-rays and ultraviolet rays have been experimented with for many years to cause changes in the chromosomes but it has been definitely proven that colchicine actually causes a doubling of the chromosome number in the dividing cells.

Colchicine is an alkaloid obtained from the crocus plant and has been used as remedy for gout and as a possible drug to combat cancer. This poison reacts on the chromosomes of plants which are the bearers of hereditary units and prevents the separation of half chromosomes during cell division. Thus when the cell divides it has twice the number as in the former cell. This new cell continues to divide and each continues its double number of chromosomes.

The customary method of application of colchicine, according to Mabel L. Ruttle,\* is treatment of seeds or seedlings with a 0.1 to 0.15 percent aqueous or a 0.5 percent alcoholic solution of colchicine for periods varying from one to several hours. Epiphyllum growers have applied the drug in lanolin (wool grease), in agar, and by spraying. Stunting may at first result but is soon outgrown and a husky or distorted growth takes its place. The flowers may be a different color or mottled, the petals may become ruffled or irregular. The time of flowering may change or the flowers will be much larger.

The treated plant may become incapable of producing fertile seeds or a hybrid that has heretofore been incapable of being crossed may become fertile. The disease resistance may be reversed; a plant that was practically free from disease may become

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\* "Revista de Agricultura, Industria y Comercio"—Puerto Rico.

susceptable while a weak plant may become immune. In fact, there is a realm of un-explored work to be done that may or may not be advantageous in this particular group of plants.

The one objection thus far seems to be that the results are not permanent and soon the changes revert to former conditions. This may be due to the new cells not being "set" which requires back-crossing with other flowers having the same doubled chromosomes. If this effect can be induced in a single branch of Epiphyllum it can be segregated by cuttings and the flowers observed several seasons. However, it is necessary to "set" the new characters by seed propagation.

### *How to Flower Epiphyllums*

There is no set rule for flowering Epiphyllums. The true species, *Epiphyllum oxypetalum*, commonly known as "Night Blooming Cereus," is used as a house plant in every state of the union and the publicity it receives in the many newspapers is proof that it flowers under varied conditions. Most of the owners of this plant do not realize they have a true cactus and their soil and care is the same as for any other house plant. It thrives in whatever garden soil is available.

There are reports that the California hybrids are difficult to flower, yet we are contacting more and more eastern growers who have excellent results. Perhaps the amateur grower lacks the understanding to grow them properly or he expects flowers too soon. Cuttings should not be expected to flower the first season. If a cutting is planted during the middle of the summer one may do well to get it established by fall, where the summer is a short one. Then comes the winter rest and the growth is made the next spring and summer. This new growth will mature and produce flowers the second spring and summer, or some hybrids will not flower until late in the season. If growing conditions are more temperate or glass protection is given, flowers may be obtained a season earlier. However, one should aim for a good plant before expecting flowers. Do not try to grow an Epiphyllum too

fast or without rest, or flowers will not result.

A plant in too much sun produces all its flowers at once and is finished for the season. The flowers will also be smaller and poorer in color than those grown in partial shade. A withered, sunburned Epiphyllum may produce blooms, but often at the expense of the plant. Under proper care or if planted in the ground, large, rich-colored flowers will result.

The first year's blooms are often undersized or off color; the plant not being well enough established to produce normal ones. Flowers of seedlings should not be described until those of the following season are checked. Growing conditions will often effect the size of blooms. The cutting of a plant having a 10-inch flower will often produce only a 6-inch one. Do not blame the dealer but strive for better cultural conditions.

An early report of 1848 shows how flowers were forced in England. Some of the early growers had learned a great deal regarding culture and we may well profit by their methods. Answering the question on how to flower Epiphyllums as house plants in the East, Dr. Roosen-Runge has covered the subject very thoroughly and we quote these two reports here.

#### *Culture in England (1848)*

"A correspondent requesting instructions on the culture of the cactus, I herewith send you some practical observations, which contain the practice of the most successful exhibitors at the London Shows of this tribe of plants. The compost I use is an equal quantity of light turfy loam and pigeon's dung, and one-third sheep's dung, exposing the mixture one year to the influence of the summer sun and winter frost to mellow. When wanted for use I add one-third of sandy peat, in both cases mixing them well together.

"I grow the young plants from February to July, in the glass forcing house, kept from 55 to 60° F. I afterward remove them to a shelf in an airy situation in the greenhouse, exposed to the midday sun, giving them plenty of air and little water. The

plants that I want to flower the following September are placed in the forcing-house the first week in December, giving them very little water for the first ten days, and gradually increasing the water as the plants advance in growth. About the first of February, I top (clip off the ends) all the young shoots, which soon become well ripened; from this time I decrease the quantity of water until they become quite dry, in order to throw the plants into a state of rest. In the beginning of March I replace them in a cold shady situation in the greenhouse, treating them as before. For plants to flower in August, I place a quantity more in the forcing-house the first week in January, treating them the same as those for September, only they are put to rest in the greenhouse a fortnight later, and replaced in the forcing-house one week sooner. The first flowering plants are put in the forcing-house the end of January, and will come into flower about the middle of March.

"When these plants have done flowering, and are removed from the drawing room or greenhouse, I prune out most of the old shoots that have flowered so that the plants are furnished regularly with young shoots for flowering the ensuing year; these plants are also placed in the forcing-house for ten days to ripen the young wood and dry up the moisture, and are then put to rest in the greenhouse as usual; such plants will flower a second time in October. Others, put in the forcing-house the middle of February will flower about the end of April; if then pruned, dried, and put to rest as before they will often flower a second time in November, and so on in proportion. I repot them at all seasons, whenever the plant may require it, always observing to keep the pots well drained with potsherds, that the moisture may pass off readily.

"This process may be considered troublesome, but superior growth, and abundance of flowers, amply repay the care bestowed. By the above treatment, *Cereus speciosa*<sup>1</sup> and *Cereus Jenkinsonii*<sup>2</sup> have generally produced from ninety to a hundred

<sup>1</sup> *Heliocereus speciosus*.

<sup>2</sup> *Epiphyllum Jenkinsonii* hybrid.

fine expanded flowers at one year old. I prefer growing them in a wooden tub, with nice stakes in the tub, to the usual mode of supporting them by sticks driven into the ball of the plant.—The Floricultural Cabinet & Florist's Magazine, Volume 16, page 207. 1848.

*Epiphyllums in the Livingroom*

Dr. Edward C. Roosen-Runge wrote, in part, the following for the "Cactus and Succulent Journal of America" so that others might know that *Epiphyllums* can be flowered indoors in New England.

"We have always lived in apartments in New England, always in rooms which were centrally heated and we never had a greenhouse, and yet, I found, that results can be satisfactory for an amateur. Of course, we cannot compete with the possessors of greenhouses or a warm climate and I am not making a plea to attempt that competition, but with a genuine liking for the plants, some patience and a few rules in mind, the specimens will grow and flower in the living room. I have always rather enjoyed the suspense of waiting for results with plants for a year or two or even more. Time with plants is quite different from what it is with animals or us human beings. They do not take part in the quick oscillations of our daily lives, they change over years and not over hours and days, and this is rather a comfort. Patience is necessary but it should not be a burden in giving them whatever care is required from day to day.

"The rules to keep in mind are few. *Epiphyllums* like air and light in summer and in winter, in our climate and anywhere else. The more air and light we can give them and at the same time supply them with an adequate amount of moisture the more growth and flowers are produced, although *some* growth and *some* flowers can usually be obtained with a relative minimum of both. Often, a place in a southern window, open whenever possible during the summer and as far away from the radiator as possible in winter is sufficient. Better still is a place in the garden during the summer. In most books on the subject, I find that



Epiphyllums should be protected from too much sun. In the cities of New England the sun does not appear to become strong enough to do harm to the plants. On the other hand, the maximum amount of sunlight available is not necessary to stimulate good growth and bloom, and in the garden a position in half shade is as good as one in the full sun.

"Early in the spring I begin to accustom the cacti to outdoor life by opening windows or putting them out on a protected porch in good weather. In the latter part of May they are set out into the garden, best into a flower bed and I sink the pots into the soil up to about one inch from the rim of the pots. This keeps the temperature of the roots much more constant and prevents quick drying of the soil. It has only one disadvantage—ants. These insects do not do any harm to the plants directly but they often introduce mealy root bugs or aphids. In one of our gardens this never occurred; in our present place it is a nuisance. However, the plants are little harmed except by very severe infestations and I found frequent soakings with nicotine solutions an efficient check to the bugs. In my experience, the advantage of sinking the pots into the soil easily outweighs the disadvantages. Little other care is necessary during the summer except for watering during dry spells.

"Epiphyllums are not desert, but forest plants and respond to plenty of water if the drainage is good. They also like fine sprays given in the evening. When a plant begins to bloom, it is usually taken inside for the time of its flowering so that it can be admired more closely. I have often been amazed at the ability of these flowers to withstand this kind of change; they hardly mind it more than *Amaryllis* do. Of course, unnecessary handling is to be avoided and we always take care not to change the direction from which the light comes, because the flowers will grow toward the light and actually become distorted in shape if they are turned away from it.

"In fall the plants are brought in before the radiators are going. This prevents the rapid change from fresh air to the dry and

warm atmosphere of the rooms. Actually the plants can stand a good deal of rough autumn weather. Once, a specimen Dr. Houghton was forgotten in its place in the flower bed and only discovered in late December when frosts had apparently killed it. On close examination, the roots were found to be quite healthy and an attempt was made to nurse it back to life. During the next year the plant developed one small shoot but another transplanting brought about complete recovery and the cactus is now again a fine specimen.

"The winter climate of our living rooms is not what plants like, and if we cannot offer our cacti anything better, it is only a matter of making them survive the winter with the least possible damage. The best way to keep the atmosphere around the plants somewhat moist is to crowd them. Fifteen to twenty good specimens of orchid cacti on a small table are such a jungle of green that they generate a miniature climate for themselves. The table is put far away from a radiator and in a light place. Under such conditions I do not spray at all but water freely all winter long. It is impossible to give the plants a real rest in the heated rooms. If one waters less the result is usually a shrivelling of the shoots and a reduction of the root system. One should, however, keep in mind that the plants must make as little growth during the winter as possible. Therefore, fertilizer is never given until spring and excess watering is avoided. If shoots are produced they are usually thin and weak and are removed in February or March. While this method of wintering over is not ideal it produces some results under unfavorable circumstances.

"If there is an unheated and light room in the house, that is the place for the Epiphyllums to hibernate. The resting plants do not mind cold as long as it does not freeze. The plants are left in the garden until frost can be expected, then taken into the unheated room. Here they are gradually watered less as the average temperature of the room goes down. In January it may be only 40° F. or little more and during that time big plants need only be watered every two weeks; smaller ones a little more often.

Treated in this way the cacti make hardly any top growth but do not shrivel, either. Some of them will probably show their first buds in February or March. Quite often the plants develop long air roots, showing their liking for this kind of rest. Incidentally, pieces with such roots make excellent cuttings which take hold almost immediately.

"Many well known hybrids have done well with me under the conditions described: Deutsche Kaiserin, Gloria, Rosetta, Vive Rouge, and Cooperi all bloomed well. Of the species, *Epiphyllum strictum* has been particularly rewarding. My own seedlings have made better growth than any plants I bought, probably because they were better adapted to our climate but they have not yet bloomed well. As to the soil in which I plant my Epiphyllums, I am a heretic. I do believe that a porous soil with much humus and good drainage is what they like, but the amount and size of the flowers which they have given me, has been little different in ordinary garden soil or in soil extremely rich in fine or coarse humus. We must realize that we keep our plants under conditions which are extremely different from their native habitats. The amount of light, the average temperature, the changes in temperature, the moisture of soil and air, all are entirely different from that found in the forests of Central America. It is worthwhile to experiment a little to find what growing medium might be the best under such changed circumstances. For best results, experiment.

"In summary, I would like to emphasize, that Epiphyllums are good house plants and produce blooms even under the adverse conditions of the New England climate and centrally heated rooms. They can be kept in the living room all the year around and be quite satisfactory plants. They give more pleasure if it is possible to winter them in an unheated and light room and to give them some fresh air and outdoor sun in summer. A collection of about 15 mature plants can furnish the living room with delightful show pieces for many weeks and even months throughout the year."

## DIFFICULTIES IN CULTURE

### *Pests and Diseases*

There are three classes of pests and diseases that the grower must recognize and know how to combat. "An ounce of precaution is worth a pound of cure" is a wise slogan yet the majority will not heed this advice until their plants have been damaged.

#### I. MISTAKES IN GROWING CONDITIONS

Sunburned plants are easily recognized by their yellow condition and in most cases will regain their green color if given partial shade. Sunburn is not always fatal but often mars the

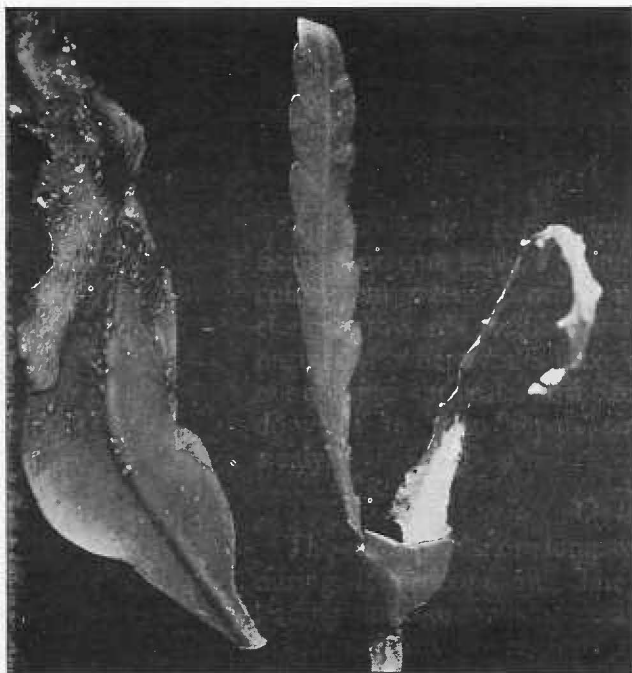


FIG. 66. When the root system is damaged or is insufficient to supply foods, there is a tendency for the branches to die back.

plant and causes some of the branches to dry up. Solution: Give plants partial shade during the hot summer. During excessively dry hot weather plants lose their lush green until cooler days return.

Withering of the branches often occurs when a plant has spent its vitality in too many flowers. Certain hybrids have this tendency and it should cause no alarm. After a rest and a slow resumption of watering they will return to normal. Sometimes in transplanting, the roots cannot stand the added requirements and some of the leaves dry up to ease the strain. Sickly branches are often caused by root decay from excessive watering, particularly in poorly drained soil.

Allowing the plants to completely dry out, which is a pernicious practice, actually kills the roots, which are much more susceptible to injury thereby than the portion of the plant above ground. After the roots are dead, watering naturally causes decay and this may work its way upward. Solution: Give the

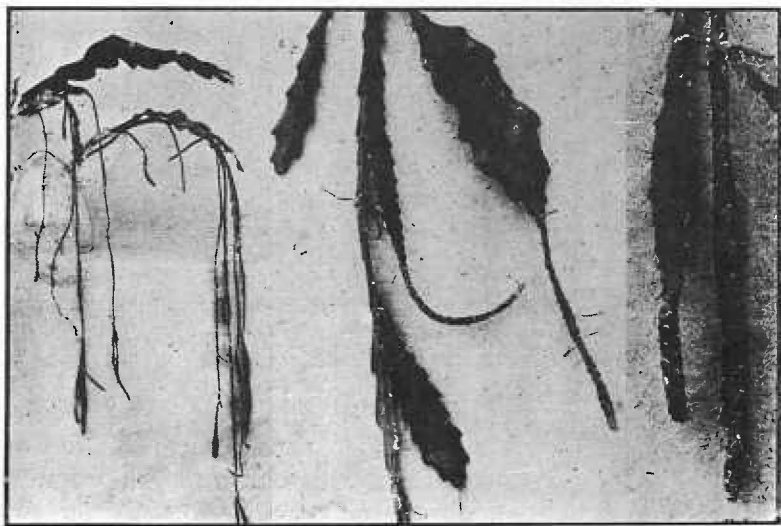


FIG. 67. The thread-like growth is caused by poor light and starved condition.

plant sufficient nourishment, well drained soil, plenty of water during warm weather yet never to the extent of soggy soil. Avoid *complete* drying out of the roots.

Bud drop-off is common in many plants, which with generous impulse, start more buds than they can carry as mature flowers;



FIG. 68. Scale is the most prevalent pest and is controlled by regular spraying.

e.g., Christmas Cactus, orange trees, etc. This is also true where plants have been bred in order to increase the size of the flowers. If a plant is moved or turned while the buds are in the process of forming, they may fall. Once buds are half developed, a plant can be moved without ill effects to the flowers. Huge plants



FIG. 69. Sow-bugs, slugs, millipedes, and crickets hide under pots and refuse.



FIG. 70. Aphis is a minute sucking insect that thrives on flower buds and defaces the flower.

have been moved from a nursery to a shopping district display location and the flowers continued for weeks. Collections have been given rough and windy transportation to cactus shows and the blooms persisted. Solution: Frequent spraying of the plant with water during the budding season will prevent many buds from falling. Be sure the plant has been getting enough water to



FIG. 71. Snails forage at night and eat holes out of the branches.

supply its increased requirements. Do not fertilize a plant while flowers are forming.

Chlorosis or yellows is indicated by the plant's becoming pale or yellowish and is a result of insufficient nourishment, particu-



larly insufficiency of potash. It corresponds to anaemia in humans. It may be caused by soil too alkaline. Poor or incompatible stocks in grafting may cause a plant to turn yellow. Solution: Try more plant food but not by too sudden applications.



FIG. 72. Slugs damage the epidermis and unsightly scars are the result.

## 2. INSECTS

Locations with insufficient sunlight and lack of ventilation breed pests of all kinds. Glasshouse benches with solid tops are ideal places to harbor sowbugs, ants, and snails. Benches consisting of slats make it easier to combat insects. Crushed rock or better yet, a cement floor discourages pests of all kinds. Refuse

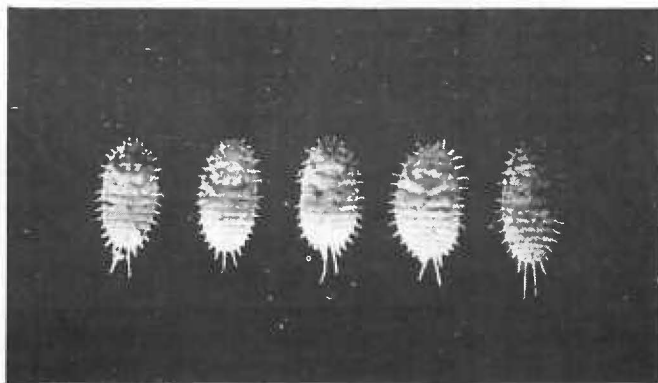


FIG. 73. Young mealybugs are small bodies usually massed on the new growth. In age they are like balls of cotton.  
(Photo 6 times natural size.)



FIG. 74. Cut worms or corn ear-worms feed on the petals and the pollen.

and board piles should not be tolerated near the lath or greenhouse, otherwise one can never expect to have clean plants. Sick or starved plants attract insects that would not otherwise appear.

Scale is the chief pest and although it does not spread rapidly it will eventually cause much damage to plants. Aphis is another minute sucking insect that attacks only flower buds and flowers. Ants feed on the secretions of aphis and therefore are partly responsible for the latter spreading. Badly infested flowers are deformed and the outer petals lose their normal shape. Remedy: Spray with "Black Leaf-40" or "Volck" as directed. Be sure not

to make the solution stronger than recommended or you will damage the plants. Repeat every few weeks so as to kill the unhatched eggs.

Root mealies and nematodes may not be discovered unless the plant is uprooted. Nematodes cause root enlargements that vary in size from a pin-head to that of a pea or even larger. Mealies are white cottony insects that form web-like masses on the roots. They are carried by ants from one plant to another. Remedy: Rather than dipping the roots in alcohol it is better to cut off the roots and re-root. An application of "Greenol" is effective in minor infestations.

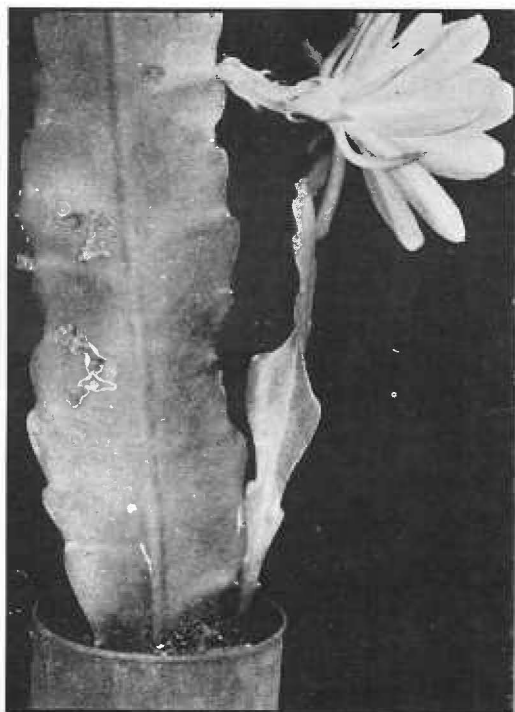


FIG. 75. Hail or slugs may cause brown scabs which deface the branches.

Sowbugs and thousand-legged millipedes damage plants by eating at the base of a branch which allows rot to set in. Solution: Sprinkle any one of several baits at the base of the plants.

Slugs, snails, crickets, and grasshoppers are most damaging to the appearance of a plant. Over night they will deface a whole branch by eating holes through it. Solution: Sprinkle prepared bait around the plants and the insects will soon disappear. Monthly application, before their appearance, will *prevent* damage to plants.

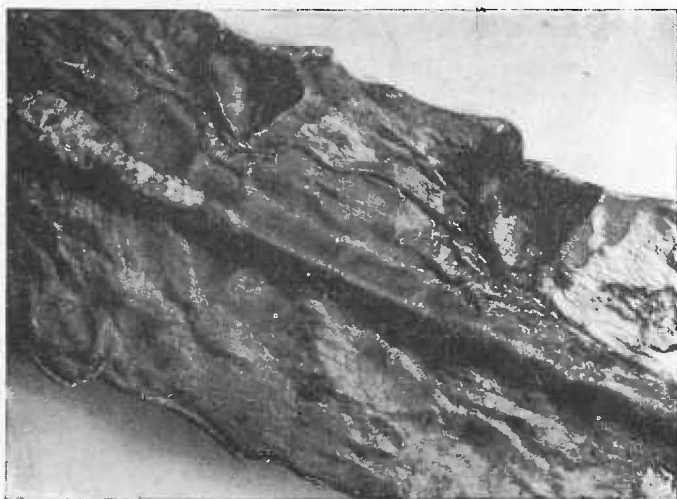


FIG. 76. Root rot causes these dried sunken areas on the branches.

Ants are spreaders of other pests and should be destroyed by setting out ant remedies early in the spring. If this is done and the containers are replenished periodically there will be no ants.

Larvae, similar to the corn earworms, hatch in the new flower and then proceed to eat the petals and pollen. The eggs are deposited in the bud by a "moth" which emerges from its chrysalis state in the ground. Remedy: Place poison bait around the pots.

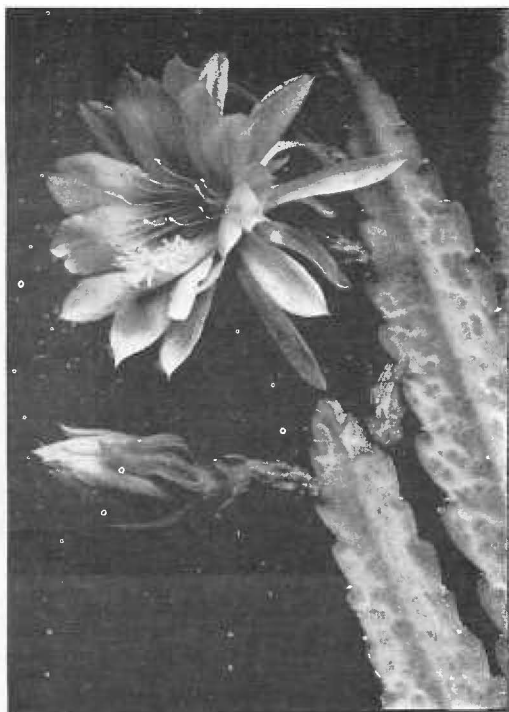


FIG. 77. Root disturbance or a soggy soil will cause golden spots in sunken areas. The flower is Empereur, a beautiful pink.

### 3. FUNGUS AND BACTERIA

Epiphyllums are subject to several fungus or bacterial diseases, the background of which is not fully known. On the whole, they are more damaging than insect pests. These diseases seem more prevalent with the ever increasing hybrids. Whether this is due to the forcing and over fertilizing or to the interbreeding of the hybrids with a lowering of their disease resistance, no one knows.

When growers were spraying with Bordeaux spray (which always left a bluish stain) we heard less of these fungus diseases

and rots. Rather than allow these diseases to spread to the whole collection, infected plants should be isolated at once or destroyed.

Black rot is a fungus that is confined to the surface of the ground and lives ordinarily on decomposing material. When too coarse leafmold is used it tends to encourage this rot which penetrates the living plant. Remedy: Cutting off the rot spots does not always remove the infection. Re-pot and both the new soil and pot should be sterilized. Add more garden loam with thoroughly aged leafmold.

Algae on the top of the soil keeps the air from permeating the soil. This green growth can be prevented if the soil is kept loose, not soggy, and with a layer of charcoal or crushed rock spread over the surface.

Root rot may be caused by plants being too dry as well as too wet. That a dry plant will not rot, may be true of a cutting but does not apply to a plant. If the small roots dry out, plants may rot when watering is resumed in the spring. The soil may become soggy and sour because the drainhole is clogged; the plant may become discolored, dull, or have a wilted appearance. Remedy: Avoid too much or too little water. Be careful not to damage roots in re-potting. If the roots become sick they must be cut back and the plant handled as a cutting.

Sunken areas giving a mottled effect may be caused by improper feeding or forcing. Often this is mistaken for a disease, whereas it cannot be remedied by spraying. Remedy: Only by a change of soil or a more moderate diet will the trouble disappear.

Golden or bright yellow spots may be caused by root disturbance and the upsetting of the ability of rootlets to absorb water. Remedy: In moving or repotting, put the plant in a protected location for a few days before watering again.

Keep plants healthy, since neglect or wrong treatment will make them more susceptible to pests and diseases. Sun and air, as with humans, are the best preventatives.

## PROPAGATION

### *From Cuttings*

Fortunately Epiphyllums are easily propagated by cuttings, otherwise it would be almost impossible to perpetuate a new hybrid; a cutting will produce its own kind. The variations from seeds are so great that seedlings from a single fruit would produce a very small percentage like the parent. In propagating from cuttings the purpose is to quickly establish a mature plant from a small piece of the parent. To grow a new plant from seeds requires three to six years for it to produce flowers, while early cuttings may produce flowers the next season.

Cuttings may be made at any time but warm weather is preferable for good growing conditions. If cuttings are made in the spring they will make considerable growth by fall. It is best to remove all buds the first season and allow the plant to make more growth. However, most growers prefer a flower even at the expense of the plant.

Cuttings can be made after the plant has flowered or even late in summer. If they are made too late they will only root without making any growth or they may endeavor to produce flower buds.

Choose the cuttings from branches that have not just finished blooming. The latter, according to experience, produce new growth only with difficulty. Sturdy branches that have produced flowers for two or three years are ripe and best. The stronger the central woody stem the sturdier will be the new plant. The larger and thicker the cutting the more "push" or strength it has to force a new plant. Too often cuttings are made from fresh succulent growths that are difficult to root and practically wither away before they are sufficiently established to grow a new branch or to continue their own growth. Cuttings made from top growth have a tendency to bend over, thus causing side growths from the end. If this happens, the tip should be quickly cut away.

Old branches which are pruned from a plant are suitable for cuttings and will form new shoots but more slowly than if taken from last year's growth. Make the cut near the base of the plant, preferably where it tapers off towards a cylindrical form. Use a clean sharp knife or pruning shears. Do not injure or crush the tissues around the cut. Do not try to paint the cut surface as the sap will quickly heal the injury. Do not make a cutting below the soil line or rot may enter the plant.

Dip the cutting in "Rootone" to hasten the formation of new roots or use sulphur to heal the cut. Allow the cut to dry in a cool, shady place from one to two weeks depending on its thickness. The purpose is to form a tough scar tissue which will resist rot; this must be done slowly, otherwise a brittle scab may be formed that will split open and become infected as the cutting starts to fill out and grow.

In an emergency to save a withered cutting of a choice variety, plant it in dry soil in a cool, shady place for a week; spray or water gradually until it starts to fill out. Such cuttings can also be started by placing them in a clear glass with a little B-1 or "Rootone" solution for three days. The action of the light and the solution encourages root growth so that the plant can very soon be placed in medium moist soil or the fattened, unrooted cutting can then be dried and treated as other cuttings.

There need be no special hurry to root a cutting; strong ones may lay for a year without losing their vigor. Often they send out air roots from the middle of the branch, from the tip, or from areoles, which take root as soon as they contact soil. This long life of cuttings makes them ideal plants for shipping, enabling them to travel around the world providing they are protected from frost.

Rooting soil should consist of German peat moss or leafmold, and coarse sand. Do not use builder's sand alone because it is not porous enough and retains too much moisture. It is difficult to root cuttings when the temperature is too high—they require a moist, cool, protected location to prevent drying out of the branches.



Place the cutting  $1\frac{1}{2}$  inches into the soil, never deeper or rot may result. Run a stake deeply into the soil next to the cutting and tie the upper part of it to the stake with a fine cord. Water regularly during warm weather but in cool weather only lightly. In a short time the cutting will have rooted.

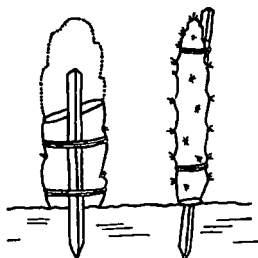


FIG. 78. Cuttings may be rooted by tying to stakes. In warm weather they may be planted deeper than during cooler weather.

As soon as roots are formed, usually within four weeks, the plants may be placed in small pots or cans containing regular soil mixture. The quart size will maintain the plant through several flowering seasons. If rooted cuttings are purchased, it is generally safer to start them in a dry soil mixture. Withhold moisture for about three days, then water very sparingly until they show signs of being re-established; this prevents the rotting which so often follows their transplanting.

The technique of propagating cuttings was greatly improved by Knebel. The growths to be used as cuttings are cut into pieces approximately 6 inches long, the cut being made from one areole across to the nearest opposite one. A sharp knife is used. The bottom end of each piece is then again cut V-shaped, using two cuts on the bias from the opposite areoles downward to the midrib. Thus prepared, the cuttings are left lying for at least three weeks in a dry, shady place in order for the cut places to thoroughly heal. Then they are stuck into very sandy soil so that the bottom areoles just touch the soil. From these areoles the

new growths arise after the rooting. Likewise these form roots and develop much stronger branches than if they were entirely dependent upon roots formed from the cut portion. From the beginning the young plants have a firm hold and thus branch better from the base.

Another successful method is to take the branches having air roots at their tips, bend them over to contact the soil, and allow them to root. New shoots will develop at this point of contact, after which the original branch may then be cut off, separating the parent from the offspring. Many hybrids produce these air-



FIG. 79. As fast as new growth is made, it should be tied to bamboo stakes. Bill Schecter of Coolidge Rare Plant Gardens demonstrates how it should be done.

roots, especially when grown under moist or shady conditions; or when too dry in an effort to re-root as they seek more food.

Care should be taken to place the cuttings in their correct growing position although they will root if inserted upside down. New growth is more difficult if a cutting is inverted.

### *Propagation From Seed*

Raising *Epiphyllums* from seeds should be left to the commercial grower. First, because years are required to produce a mature plant from seed, and second because of the high mortality of seedlings. Non-commercial growers should master the growing of cuttings successfully and avoid the disappointment in seedlings.

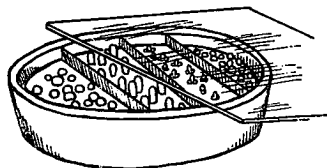


FIG. 80. Seeds are planted in a pan which is covered with glass to maintain a humid condition. Never allow seedlings to become dry.

Seeds should be at least six months old, preferably nine months, unless given special treatment under artificial light. Lay the seeds on a coarse soil containing leafmold and cover with a thin layer of charcoal such as is regularly used in chicken feed obtainable at poultry supply houses. Keep moist. Shade from bright light with newspaper and keep warm with an optimum temperature range of about  $65^{\circ}$  to  $90^{\circ}$ . The seedlings usually sprout within two weeks, providing the seed is not too fresh.

When the seedlings are about one-half inch tall they may be transplanted an inch or two apart into flats of leafmold and sand. Then in six months or so transplant them into two-inch containers. Do not transplant in cold or damp weather unless glasshouse protection can be given.

As soon as seedlings are large enough to handle, they may be grafted, as this process enormously speeds up their growth. *Selenicereus* species, particularly *S. macdonaldiae*, make good grafting stock. Cut off the tip of the stock and place the seedling, with its base cut off, on top. After it has made sufficient

growth the three-inch branches may be regrafted onto *Opuntia* stock. Older growth may be treated as cuttings and put on its own roots.



FIG. 81. Tips of seedlings can be placed on *Selenicereus macdonaldiae* to speed their growth.

The study of seedlings is fascinating. Sometimes parentage can be traced through them, since the juvenile form may have inheritance-characteristics not found in the mature plant. Seedlings always start life with at least two cotyledons (seed-leaves) and then develop three, four, or five angles before settling down to a two or three angled branch.

There is little use in forcing Epiphyllums. This will happen if they are constantly given "warm feet." They will indeed develop luxuriant growth in intensely warm air, but their power of resistance will be lowered. However, forcing may be resorted

to, in order to bring them to a good size as quickly as possible, in which case a glasshouse should be at the grower's disposal during the winter months.

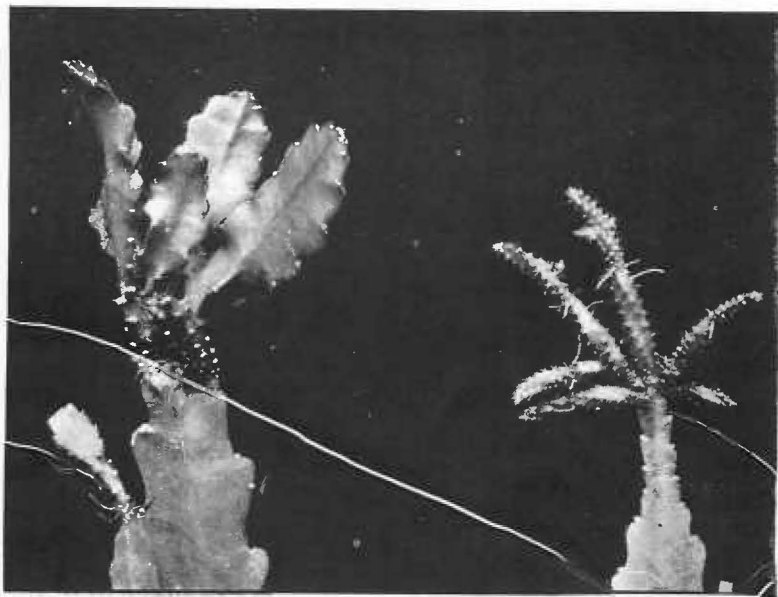


FIG. 82. Larger seedlings may be grafted on husky *Epiphyllum* branches.

### *Propagation By Grafting*

*Epiphyllums* grow well on their own roots but grafting forces growth and an earlier maturity. In seed culture for checking hybrids, time is saved in obtaining earlier flowers on grafts. A small or rare cutting should be grafted rather than risk its loss by the regular rooting methods. Or, a Christmas Cactus can be grafted so that a better shaped plant may be produced.

Commercial growers find that more cuttings can be produced when *Epiphyllums* are grafted on the spineless *Opuntia*. In most cases grafted plants take on the vigor and hardiness of their stock. We have seen robust branches of grafted *Epiphyllum* hybrids at

least six inches wide and three-quarters of an inch thick. It would be difficult to provide enough food in a pot to grow a plant of this size.



FIG. 83. A wedge-shaped graft of Beahm's new Miss Santa Monica. Same plant photographed in bud and with fruit.

A private grower, Mr. M. J. Black of Hollywood, California, grafted a Conway's Giant on a spineless *Opuntia* beside his garage where there was lath protection. The first year it did not flower; the second it had thirty flowers; the third two hundred and twenty; the following years there were too many to count. The

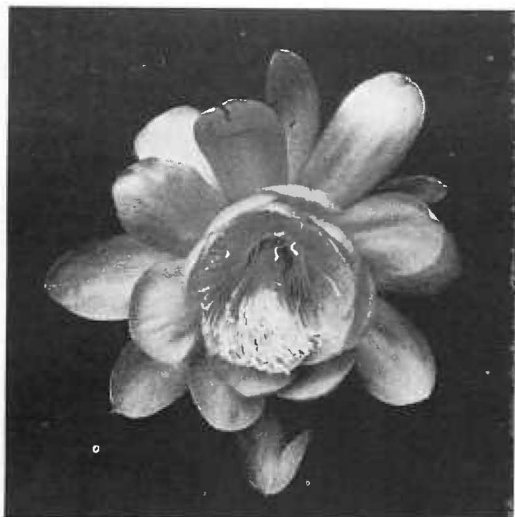


FIG. 84. The cup-shaped flower of Miss Santa Monica is outstanding in its orange color.



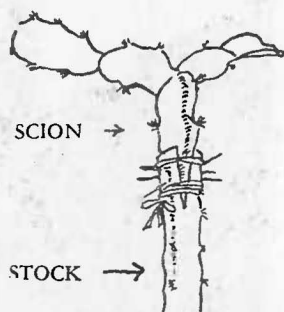
FIG. 85. A grafted plant produces many flowers over a longer period. Rare plants are usually grafted.

plant now covers a trellis eight feet tall and sixteen feet long.

Three types of *Opuntia* grafts are used: 1. The cleft graft, made by cutting an edge of the *Opuntia* pie-shape and inserting



FIG. 86. An *Opuntia* pad, in the Beahm Gardens, is 30 inches across and has been used as a grafting stock for fifty plants during the last 15 years.



A wedge-shaped graft showing stock and scion.





FIG. 87. A graft will produce an earlier flower than a plant on its own roots.

the sharpened scion which is held fast with spines and cord. 2. The inverted or slit graft, by slitting the *Opuntia* and inserting the *Epiphyllum*, allowing it to hang in an unnatural position. 3. The third method is used for grafting an *Epiphyllum* branch having a firm woody mid-rib; take two jointed *Opuntia* pads, cut off the top pad about an inch above the joint and push the tapered midrib of the *Epiphyllum* down below the ring of woody fibers where the two pads join; no ties will be necessary since the woody fibers will hold the graft in place.

Formerly, *Pereskia* was the popular grafting stock for the

Christmas Cactus but in later years *Selenicereus* and the spineless *Opuntia* have largely replaced it. It is essential to use clean knives and to make the cuts so that only the inner tissues of the stock and scion are in contact. Grafting should be done when the weather is not too hot or the cuts will dry out before they knit. Europeans tied damp moss around the graft to keep out the dry air but there is danger of rot.

Grafting stock must receive sufficient food supply to maintain the requirements of the graft, otherwise it will "go to pieces" or wither. The stock often rots because its growing season may not be the same as the scion and for this reason many growers prefer to grow the Orchid Cacti on their own roots.

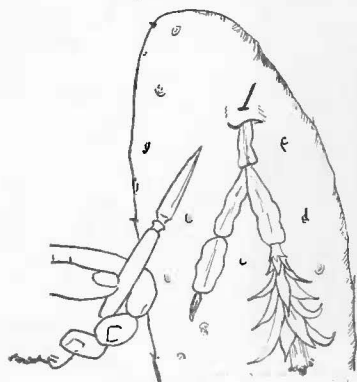


FIG. 88. The inverted graft is not recommended because it is not a normal growing position.

RIGHT: The woody scion is inserted deeply into the *Opuntia* joint and bound with cord. Once the graft is set it will require no support.



## THE EPIPHYLLANAE

The word "cactus" is usually associated with vicious spines, desert heat and no moisture. However, the plants in the subtribe Epiphyllanae are exactly the opposite because their adaptive specialization has led them away from their cactus-like brethren. The members of this subtribe are all epiphytes, or at least humiphytes, i.e.. their habitat is on or near tropical forest trees where they anchor themselves to the rough bark, rooting in the decomposed matter found there, or sometimes in the crevices of rocks beneath.

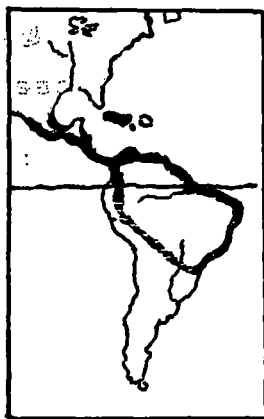


FIG. 89. Distribution map  
of the Epiphyllanae.

Although accustomed to a much moister atmosphere than the desert species, their condition is one of perfect drainage, where the moisture never becomes stagnant. It is important to understand that this epiphytic habit of growth does not imply that any of these plants are parasites; they never draw their nourishment from the living tissue of other plants, but merely use them as a *place* to grow.

Many of these closely related species are native to Mexico, while some are found in Central America, on the northern coast of South America, in the vicinity of the Amazon river, in Brazil and Paraguay, and in other tropical districts of the Americas.

The Epiphyllanae (which term includes Epiphyllums and other plants closely related), are almost spineless except in the seedling stage when they show their evolution more plainly. Spines, therefore, do not always indicate a cactus. To be a cactus (and an Epiphyllum) a plant must have all of the following characteristics: it must be a perennial (not dying after flowering); seedlings must have two or more Cotyledons or seed-leaves; it must possess areoles (specialized points, usually felted or naked areas, where new growth, flowers, bristles, or spines originate); the flower petals must be arranged above the ovary (fruit); and the fruit must have its seeds sprinkled throughout the pulp without cell divisions.

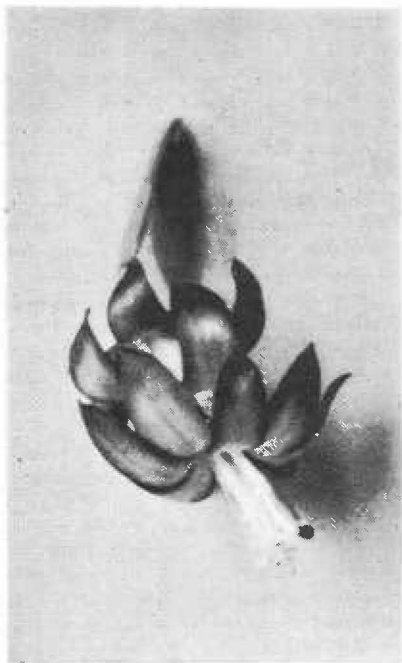
The stems or branches of Epiphyllums are jointed or leaf-like, in fact most people incorrectly call them leaves. The areoles are borne along the margins, usually in the crenations or sunken areas of these branches. Some of the joints are thick and three-angled with the bases cylindrical and somewhat woody. Other plants in this group may have thick, round, and flattened to almost globular, short joints.

Britton and Rose in "The Cactaceae" separate the Epiphyllanae into nine genera, all having leaf-like joints, long slender stamens and pistils, and red or purple spineless fruit.

The first three genera, *Zygocactus*, *Epiphyllanthus*, and *Schlumbergera* are grouped together. Excepting the last, they have more or less irregular (zygomorphic) flowers. New growth is from the ends of the short branches.

#### ZYGOCACTUS

*Zygocactus truncatus* is the well known Crab or Christmas Cactus and is an old favorite pot plant. It has been in cultivation since 1818. Formerly it was known under the name Epiphyllum.



#### PLATE X

Dr. S. F. Darling's color photo of the flower known as Christmas Cactus. The plant does not correspond with the descriptions nor pictures of *Zygocactus truncatus*. It may be one of the variations in the genus, a natural hybrid, or it may be the *Schlumbergera russelliana* that is vaguely known. We believe the latter is more likely because: 1. The flower is less zygomorphic. 2. The branches are sometimes 3 to 6 angled without distinct horns. 4. Its habitat is in the more open areas of the Organ Mountains of Brazil where it flowers in December. 5. Checks with the photograph on page 120. Collected plants are needed to make further comparisons and if it proves that *S. russelliana* is the Christmas Cactus then *Z. truncatus* can only be called the Crab Cactus. Many cacti have two flowering periods and whether the cultivated plant in question, flowers in December or early spring, is of minor importance.



FIG. 90. An early drawing of *Zygocactus truncatus* from Schumann.

It is a native of the Organ Mountains and other ranges in the state of Rio de Janeiro, Brazil. The plant has a graceful arching habit, much branched into many short joints, thin and glossy, indistinctly toothed along the margin, and ending in a pair of longer teeth which resemble the claws of a crab and accounts for the popular name. The areoles are small and bear a few bristles, but no spines.

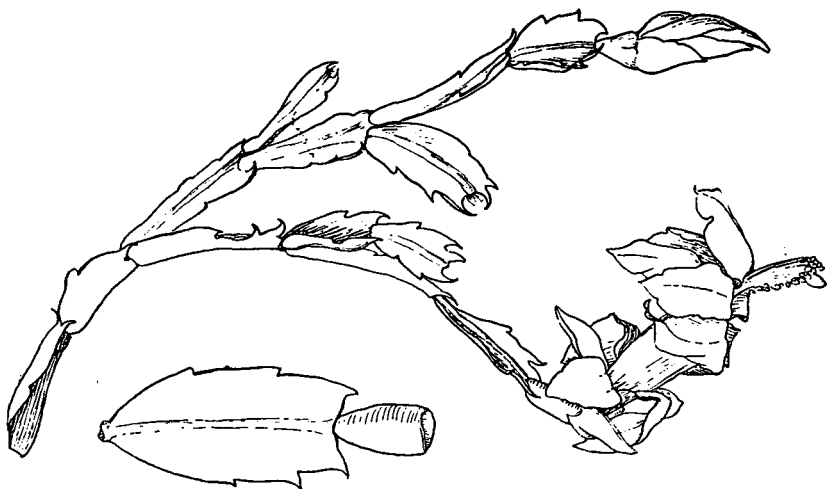


FIG. 91. *Zygocactus truncatus* (from Britton and Rose). A zygomorphic flower is one that can be split only at one point so that both halves are alike.

The zygomorphic flowers are borne at the ends of the joints. The tube is sharply bent upwards above the ovary, then follows a whorl of apparent petals, which are in reality scales masquerading as petals, alike in color and texture to the true petals at the end of the tube. The corolla is two-lipped, caused by the fact that the upper petals are longer than the lower ones, also the latter are sharply bent backwards. The long white stamens are in two separate clusters of unequal length, the longest at the top. The purple stigma is closely pressed to the upper side of the corolla.

The typical color of the petals is a bright magenta-pink with a silky sheen. There are many variations in color, ranging from almost pure white through purple, carmine, wine-red, brick-red, to salmon. The blooming season varies and may be as early as October and as late as May. The normal flowering time of the type is about December, hence its name Christmas Cactus.

The genus contains only a single species but one of the greatest European cactus specialists, the late Franz de Laet of Antwerp,

Belgium, listed in 1925 as many as 33 distinct named varieties; cactus literature mentions many more. Unfortunately only a few of these are in cultivation in this country.

Variations exist also in the joints, which may be almost without teeth to long, pointed claws, and range in color from yellow-green to deep purple. The fruit of *Z. truncatus* is obovate,



FIG. 92. Christmas Cactus photographed by Ladislaus Cutak, St. Louis, Missouri.





quite smooth and glossy, containing numerous shining blackish-brown seeds.



FIG. 93. *Epiphyllanthus microsphaericus* has the branch of an *Opuntia* and the flower of a *Zygocactus*.

#### EPIPHYLLANTHUS

In the next genus, *Epiphyllanthus*, we find plants much less familiar than the last, and seldom seen in cultivation. They may, for curiosity's sake, be mentioned here. The flowers are very similar to those of *Zygocactus* and are irregular, but otherwise the plants are very different, quite resembling minute *Opuntias* in the manner of growth of their joints, dotted irregularly with bristly or spiny areoles. Of the three known species, *E. obovatus* resembles a miniature Prickly Pear with its flat, oval pads, while

*E. microsphaericus* and *E. candidus* have cylindrical joints; the first two species have purple flowers, the last, white. All three

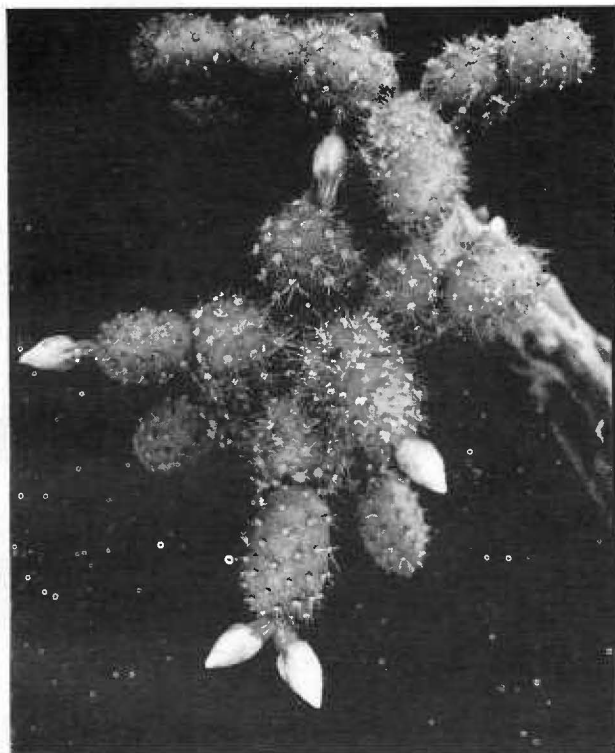


FIG. 94. E. C. Hummel's plant of *Epiphyllanthus microsphaericus* with a coral-pink bud.

grow on trees or rocks and are found in the same locality, Mt. Itatiaya in Central Brazil. They are reported as difficult to grow in cultivation.

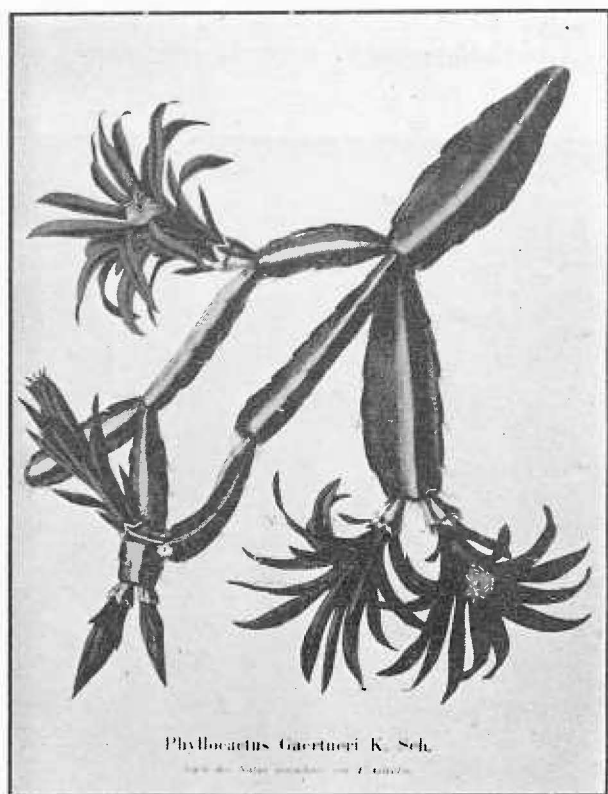


FIG. 95. An early drawing of *Schlumbergera gaertneri* from Schumann.

#### SCHLUMBERGERA

In *Schlumbergera* (named after F. Schlumberger, an amateur collector of cacti and begonias), we have plants long in cultivation, though much less common than *Zygocactus*. They very much resemble *Zygocactus* in habit, but their flowers are different, being regular, with spreading, slender pointed petals. This fact resulted in their being placed in a separate genus; formerly they were classed with *Zygocactus* as well as *Epiphyllum*. Be-



FIG. 96. A section of a hanging basket of *Schlumbergera gaertneri* at Coolidge Rare Plant Gardens.

cause they flower about Easter time they are commonly called Easter Cactus.

There are two species. *Schlumbergera gaertneri* has deep scarlet flowers at the end of flat leaf-like joints, oval and rounded off on top, or truncate (cut off square) as in the Christmas Cactus; the edges are lightly indented. This very beautiful plant deserves to be more widely grown. *Schlumbergera russelliana* was named for the Duke of Bedford (Russell family), who assembled at Woburn Abbey one of the finest cactus collections of his time, one hundred years ago, and one of whose collectors discovered the plant in Brazil. It has reddish-purple flowers. The fruit of both species is distinguished by being strongly ribbed.

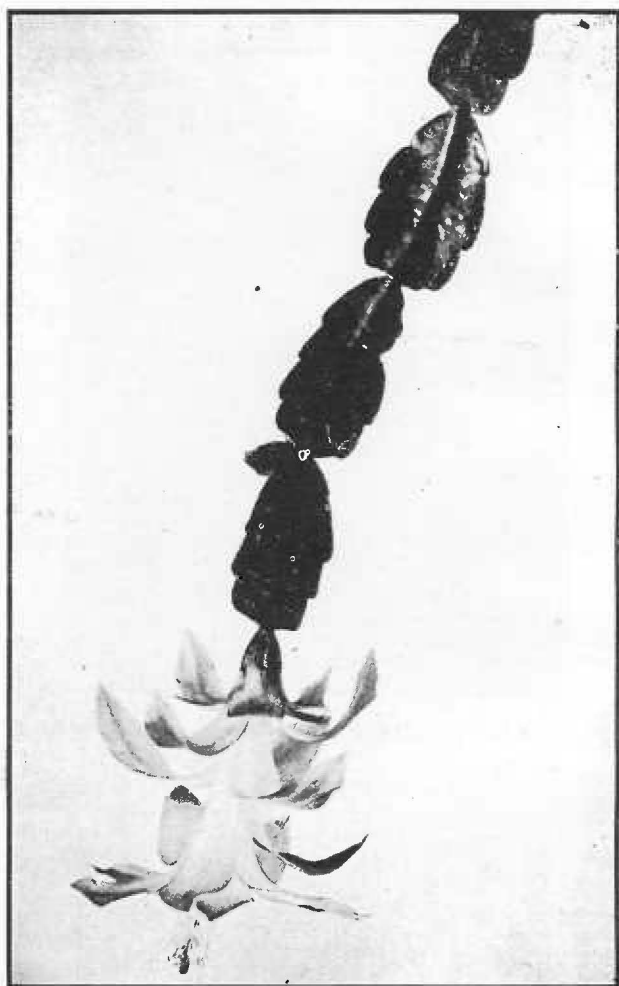


FIG. 97. *Schlumbergera russelliana* as shown in Contributions from the U. S. National Herbarium.

To make specimen plants, this cactus was often grafted on *Pereskia pereskia* as a stock. In this way it appeared as umbrella-shape growing out of the straight woody stem. Sometimes the grafting was done in such a way that the branches took on the shape of a fan, or an appearance like the spokes of a wheel. Grafted plants are usually more floriferous than those grown on their own roots. Some growers object to the *Pereskia* as a stock because it goes nearly dormant in winter, just when the scion is putting forth its greatest effort. These growers prefer the straight-stemmed *Nyctocereus serpentinus*, or *Opuntia elata*.

The remaining genera, including *Epiphyllum*, differ from the foregoing in that they branch irregularly instead of dichotomously (in pairs).



FIG. 98. *Disocactus biformis* branches irregularly and has an unspectacular flower.

## DISOCACTUS

*Disocactus biformis* and *Disocactus eichlamii* have cylindrical stems, from which grow many flattened, leaf-like joints. The small flowers open in the day time and last for several days; they have few petals, long, narrow and spreading, magenta in the former, bright red in the latter. They are natives of Honduras and Guatemala and rare in cultivation.



FIG. 99. Early drawing of *Disocactus biformis* from Schumann.

FIG. 100. *Chiapasia nelsonii* has many pink flowers. It should be in every collection.

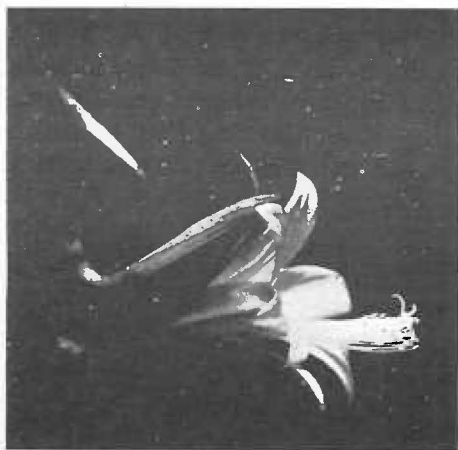


FIG. 101. *Chiapasia nelsonii* in fruit. Note the spotted branches caused by Bordeaux spray.





## CHIAPASIA

*Chiapasia nelsonii* is from the mountains in Chiapas, Mexico. It is a fine plant and should be included in all collections. It is free branching with stems thinner than those of *Epiphyllums* and produces many lilac-pink flowers that last several days. The flower is about two inches long and opens somewhat like a morning glory.



FIG. 102. *Ecremocactus bradei* imported from Costa Rica. Wax-like flowers were produced in October.

## ECCREMOCACTUS

*Eccremocactus* has one species, *E. bradei*, from Costa Rica. It has flat, thick, jointed stems with areoles bearing spines; in cultivation the spines are often lacking. The flowers are only 2 or 3 inches long, wax-like, nearly white and not spectacular. The crenations on the branches are shallow. The thickened stems are easily distinguished from those of the *Epiphyllums*.

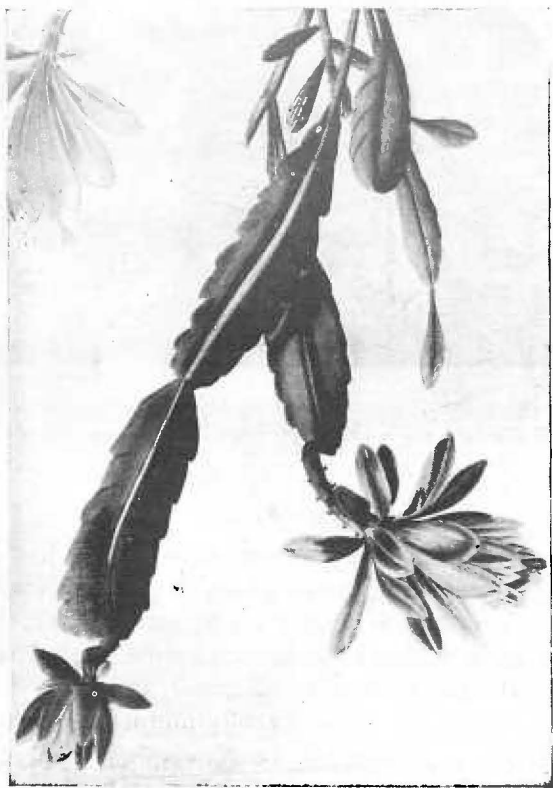


FIG. 103. Drawing of *Nopalxochia phyllanthoides*.

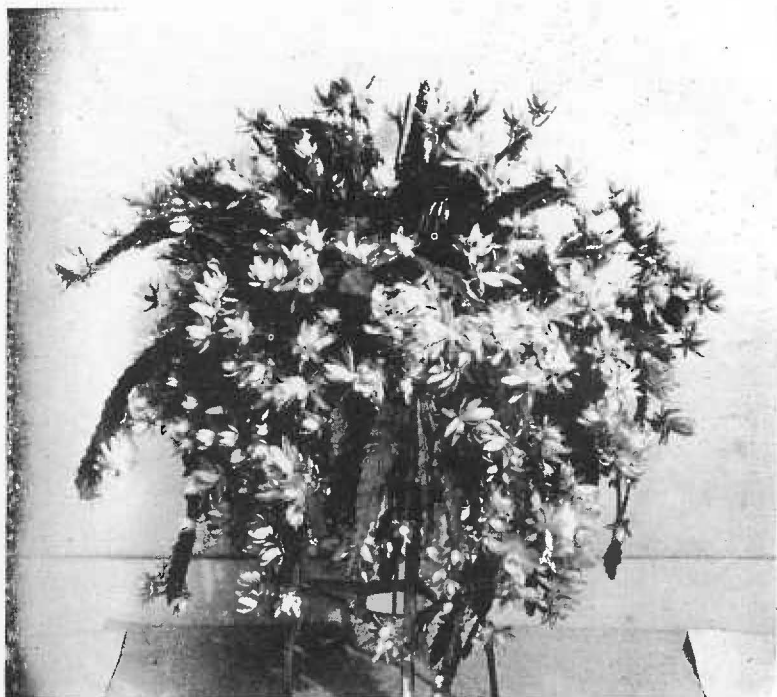


FIG. 104. The hybrid, Deutsche Kaiserin, produces masses of flowers. The foliage is usually marred with spots which cannot seem to be eradicated.

#### NOPALXOCHIA

*Nopalxochia* (from the ancient Aztec name for the plant) *phyllanthoides*, is a well-known plant, long in cultivation. It was described as long ago as 1651 by a Spanish writer. Before the new dispensation, it used to be known by the less barbaric sounding name of *Phyllocactus phyllanthoides*, and is one of the chief parents of the pink-flowering Epiphyllum hybrids.

Mr. T. Macdougall states in the November, 1945, *Cactus and Succulent Journal*, "*Nopalxochia phyllanthoides*, under any name, is a species that "belongs." It appears to have escaped

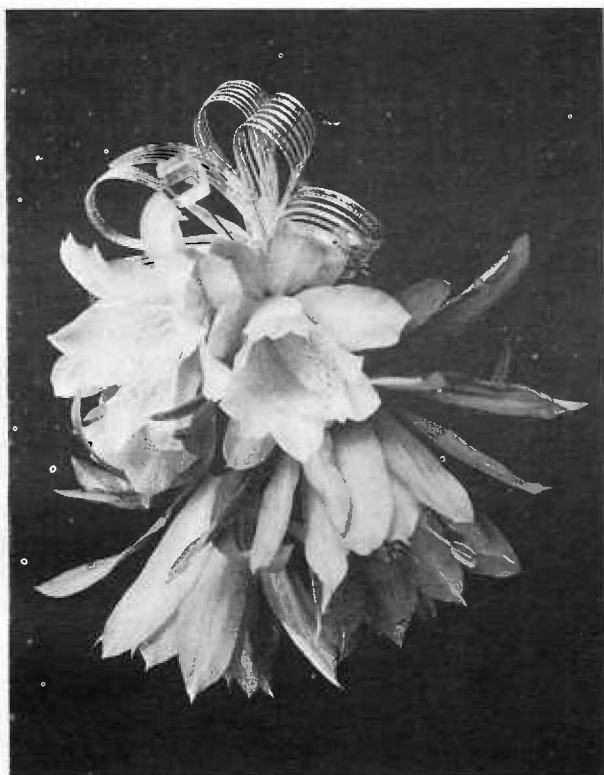


FIG. 105. A corsage of Empress types made by Mrs. Cactus Pete. The firm flowers keep well in a corsage or as cut flowers. Individual flowers may be preserved for a month if placed in a jar in the ice box; even the large flowered Orchid Cacti remain open and hold their crispness.

suspicion of hybrid origin, but is even less known in the wild than *Epiphyllum ackermannii*. The only reference I have discovered, as to its possible habitat, is in Vol. 50 of *Biologia Centrali-Americana*, from which comes this quotation, 'growing on trunks of trees among orchids . . . Southern Mexico, near Tlacolula.' Today trees are scarce near Tlacolula, orchids still scarcer,

and *Nopalxochia*? Also, cultivated plants of *Nopalxochia phyllanthoides* are missing in this region and that is usually good evidence. Conversely, because of plants—to be seen from the train—at native houses between Cordoba and Orizaba, I believe this region to be the more likely habitat.”

The growth is of the familiar *Epiphyllum* type, cylindrical at the base, flattening out into rather stout flexible joints, crenate, with a strong midrib. The flowers are rose-pink, smaller, and more compact than those of *Epiphyllum* and with a shorter tube. There is a very fine variety of this, or perhaps a hybrid, known under the name of “Deutsche Kaiserin” or “The Empress,” uncommonly floriferous and very frequently encountered as a house plant.

If this book were concerned with taxonomy, it might include the elusive *Ackermannii* as a species of *Nopalxochia*.<sup>\*</sup> Since the former has been rediscovered as a wild species we will wait for a taxonomist to make a complete reclassification instead of adding to the confusion at this time.

#### WITTIA

The last of the subtribe *Epiphyllanæ*, with the exception of the genus *Epiphyllum* in which we are chiefly interested, is the genus *Wittia* with its two species, one from Peru and the other from Panama. The genus forms a transition to the next subtribe, the *Rhipsalidanae*. From the areoles of the leaf-like joints there grow, all along the margin, in the manner of *Rhipsalis*, many small candle-like flowers, one from each areole. The flowers are followed by small berry-like fruits. In contrast to *Rhipsalis*, the flower-tube is much longer than the few erect petals. Very rare in cultivation.

<sup>\*</sup>In 1935, F. M. Knuth in his “Kaktus ABC,” transferred *Epiphyllum ackermannii* Haw. to *Nopalxochia*. This classification has been accepted by a few writers since that time.

PLATE XI



The Empress or Deutsche Kaiserin is used as one of the parents for developing small types of hybrids.

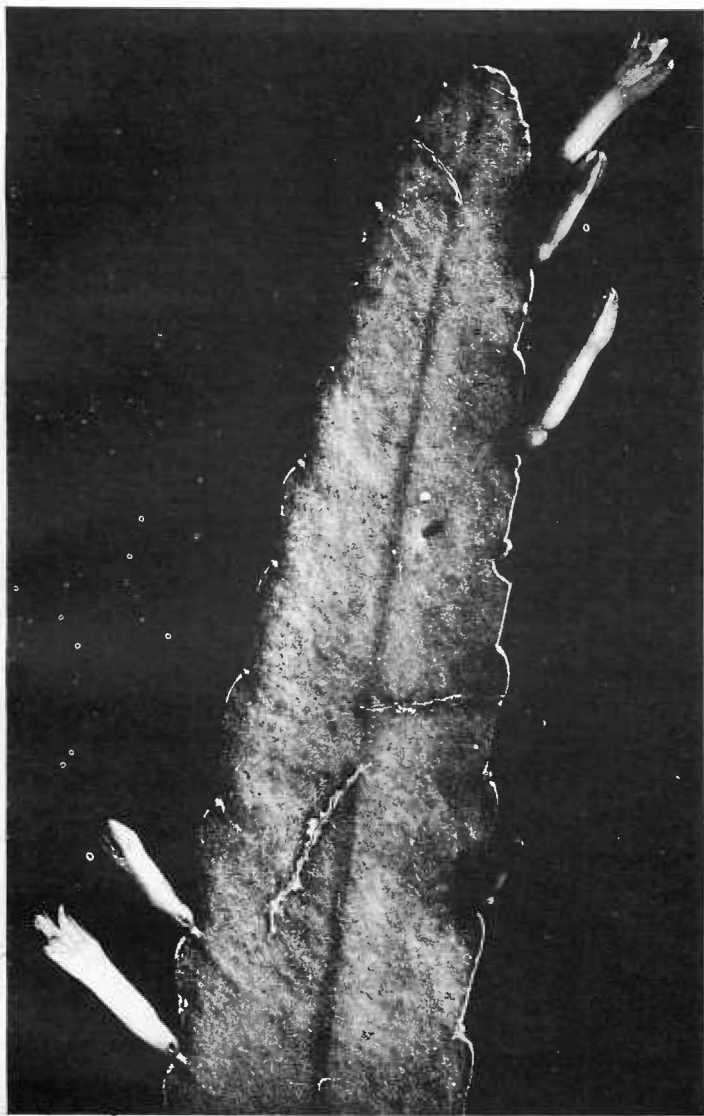


FIG. 106. *Wittia panamensis* has a typical Epiphyllum branch but uninteresting flowers.

## NEW GENUS

The latest discovery of an Epiphyllum-like plant is *Lobeira macdougallii*, named for Mr. T. MacDougall who discovered the

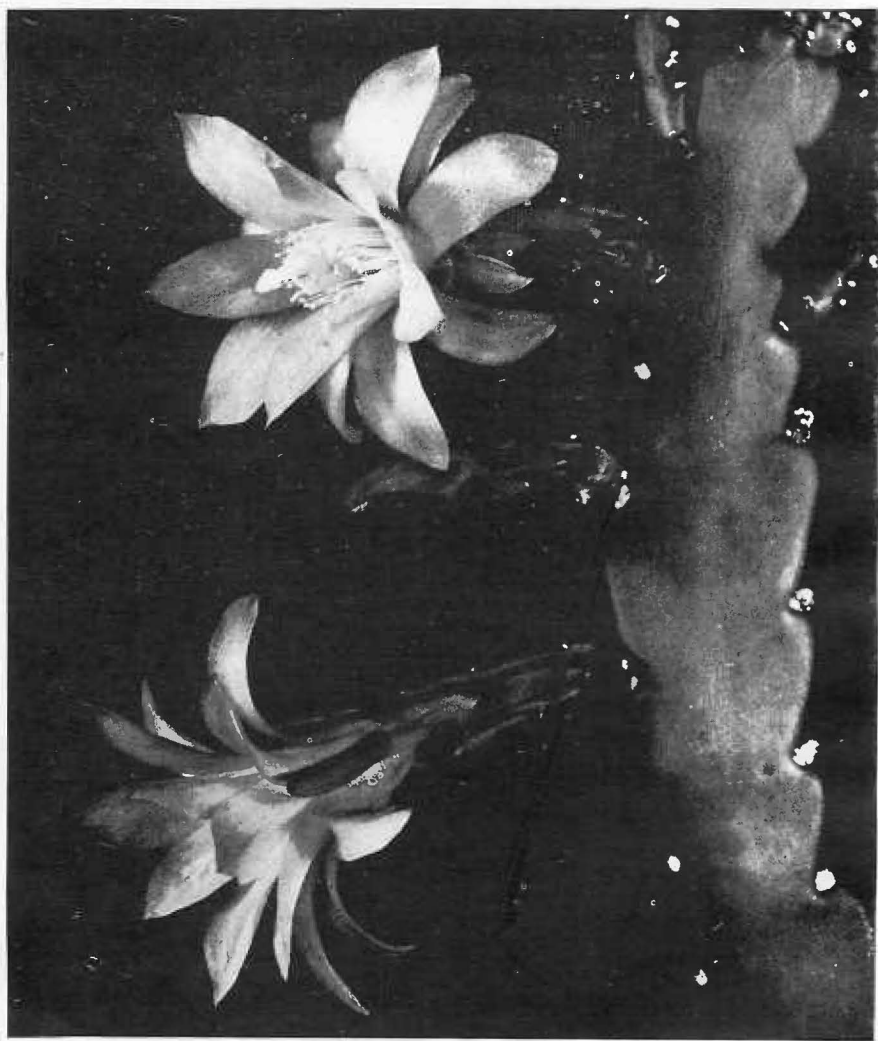


FIG. 107. *Lobeira macdougallii* resembles *Aporocactus* in its flowers.



plant in Mexico. Later Dr. E. J. Alexander found it growing at an elevation of 7500 feet in the foothills of Cerro Hueitepec. Dr. Alexander says,\* "It grew about 30 feet up on a horizontal branch of a 100 foot oak. There were about 100 flowers past bloom but in young fruit. The plant was a huge pendant and upright mass about 6 feet long and 4 feet across with hanging branches 3 or 4 feet long."

The pictures show the plant well. The flowers are described as, "reminiscent of the flower-type represented by *Aporocactus conzattii*, but the stems are *Epiphyllum*-like. Since flowers of similar construction are widely scattered throughout the subtribes of the *Cereeae*, there seems no objection to their presence in the subtribe *Epiphyllanae*."

The prominent woolly areoles, the diurnal, purplish rose flowers, with the tube and perianth of equal length, grooved tube, and markedly funnel-form with the tube passing gradually into the perianth proper, are characteristic differences separating *Lobeira* from other genera in the *Epiphyllanae*. This may be a connecting link between *Aporocactus* and *Epiphyllum*. At least, new discoveries add a constant zest to the study of these plants.

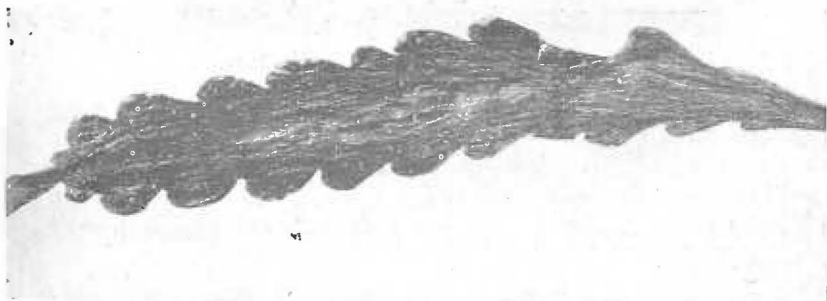


FIG. 108. In the genus *Rhipsalis* there are plants with flattened branches.

#### OTHER CACTI SIMILAR TO EPIPHYLLUMS

In the evolution of cacti there are many genera in which the branch forms are quite similar to *Epiphyllums*. In fact, without

\*Cactus and Succulent Journal of America, Dec., 1944.

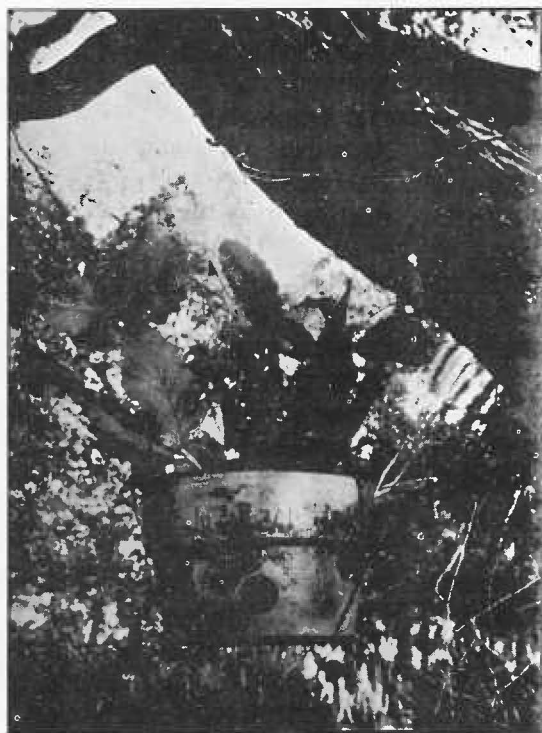


FIG 109. *Rhipsalis crispata* with minute flowers  
growing in the Huntington Botanical Garden,  
San Marino, California.

both flowers and branches some are practically impossible to identify. We will briefly mention a few of the more common kinds, many of which grow under similar conditions to the Epiphyllums.

*Rhipsalis* is a widely distributed genus of cacti commonly called Wicker Cactus because of their fine wicker-like branches. Some of the species have flattened branches that appear to be miniature Epiphyllums. The flowers, however, have no tube, are small with fewer petals and a short pistil. Because of their small size the flowers can in no way be confused with those of an



FIG. 110. *Pseudorhipsalis macrantha* is one of the new finds which makes a spectacular plant.

Epiphyllum. Those having flattened branches such as *R. houlletiana*, *R. crispata*, etc., make graceful additions to collections.

*Pseudorhipsalis* is a little known genus whose flattened branches bear small flowers with a short tube. The species *P. alata* has been known since 1788, while a recent discovery, *P. macrantha*, was described in 1942.\* The latter has a tube one inch long and

\*Cactus and Succulent Journal of America, Feb., 1942.

the few petals spread to 3 inches. The former species hails from Jamaica, the latter from Mexico, while the third, *P. himantoclada*, is found in Costa Rica.

There are other genera of epiphytic, vine-like cacti that might be crossed with *Epiphyllums*, such as *Werckleocereus*, *Wilmatea*, *Mediocactus*, *Deamia*, *Weberocereus*, etc. These are all jungle loving plants from the semi-tropical regions.



FIG. 111. *Pseudorhipsalis alata* appears to be a minute *Epiphyllum*.

## EPIPHYLLUMS—TRUE SPECIES

In discussing the genus *Epiphyllum*, we are confronted with its confusion in name with *Phyllocactus*. Britton and Rose, in their monograph on cacti, accepted the former name to conform with the rules of nomenclature which give priority to the first name published. Some authors claim that *Phyllocactus* should be used because of its general use for nearly a hundred years but it has not been declared valid by the Botanical Congress.

The name "Phyllocactus" comes from the Greek, meaning "leaf-cactus." It is composed of two words: phyllon (leaf), and cactus. Actually both parts of the word are incorrect. These plants have no true leaves and the word "cactus" was applied to a spiny Sicilian plant which bears no relationship to the American plants which carry its name. It probably was first applied to cacti because they, too, are mostly spiny plants.

The word "Epiphyllum" means in Greek, "upon-the-leaf," and refers to the fact that the flowers are produced on what appeared to early writers as leaves. As has been stated there are no true leaves and thus the flowers are produced on the branches or body of the plant. Under the International System of Nomenclature we have adopted Haworth's name of 1812, "Epiphyllum" as the correct name of the true or wild species.

The crosses between Epiphyllums and other cacti are spoken of as Epiphyllum hybrids or Orchid Cacti. In actuality Epiphyllum hybrids are those between true species only. When another genus is introduced as one of the parents the offspring should be given common names; collectively they could be called "Orchid Cacti." Neither can "Phyllocactus" be used for such hybrids since this term has been applied to both true species and hybrids.

Again for the sake of clarity we will continue to speak of the hybrids as "Epiphyllum hybrids" until the name of "Orchid Cacti" becomes more generally used. To aid in distinguishing between the true species and the hybrids, the former, as well as scientific names, are always *italicized*; those of the hybrids begin with a capital letter, for example—Cooperi.

Under "Phyllocactus," the Europeans included those genera that we accept today under *Epiphyllum*, *Chiapasia*, *Eccremocactus*, and *Nopalxochia*, as well as all of the hybrids. Under "Epiphyllum" they included *Zygocactus* (Christmas Cactus), *Schlumbergera* (Easter Cactus), *Epiphyllanthus*, and sometimes *Nopalxochia*. In Great Britain and more recently in most of Europe the system of Britton and Rose is finding acceptance. The present day confusion in generic name is due to the uncertain early descriptions and the subsequent splitting of the genera.

The genus *Epiphyllum* was erected in 1812 by the English botanist Haworth for *Cactus phyllanthus*, which was first introduced in 1753, and named by Linnaeus. In 1819 a new species of Epiphyllum-like plants was discovered and Haworth added this to his genus, calling the new plant *Epiphyllum truncatum* (known today as *Zygocactus truncatus*).

In 1831, the botanist Link, noting the differences in the flowers of the two species erected a new genus, *Phyllocactus* and assigned *Cactus phyllanthus* as the type species of his new genus. This was an error, as the same species cannot be used as the type for two genera. The mistake was not noticed at the time and botanists of the day accepted *Epiphyllum* as the proper generic name for *Epiphyllum truncatum*, and *Phyllocactus* for *Cactus phyllanthus*.

In 1890 Karl Schumann attempted to correct this mistake by erecting the genus *Zygocactus* for *Epiphyllum truncatum*, but he continued the erroneous use of *Phyllocactus* for *Cactus phyllanthus* and it was not until 1923 that Britton and Rose completely corrected the error and confirmed the genus *Zygocactus* with the one species *truncatus* and affirmed the validity of *Epiphyllum* for *Cactus phyllanthus* and 16 other species. Usage is hard to combat, and German botanists still use *Phyllocactus* as the name for the same plants that we call *Epiphyllums* and the hybrids.

Various botanists have recognized a different number of true species. This is to be expected since opinions vary in classification, and botany is not an exact science. Each is entitled to his



FIG. 112. An early drawing of *Epiphyllum phyllanthus* which was called *Phyllocactus phyllanthus* in 1831. Britton and Rose describe the tube as 7-9 times as long as the petals.

own views and as their findings are published they are accepted or rejected until the majority agree in standardizing names. Too often wild plants are not available for study, and incomplete, confused, and inaccurate conclusions are thus recorded.

Early writers knew of only a half dozen wild species, others were unable to trace the source of some of the hybrids and believed them to be true species, thus recording many that have never been re-collected and checked. Britton and Rose published sixteen species and these we will accept until field work brings to light other new kinds. To this number an additional one may be added, *Epiphyllum ackermannii*.

*Epiphyllum ackermannii* was assigned to the genus *Epiphyllum* by Haworth in 1829 but later botanists considered it to be a hybrid because it was not again found in nature. Britton and Rose also considered it a hybrid. In 1943 Charles L. Gilly, Sr., found the plant in its natural habitat, thus proving its validity as a species, but necessitating its exclusion from the genus *Epiphyllum* because the flower tube is not longer than the limb.

Because all of the true species have white flowers, collectors or growers are not so greatly interested in them as in the colorful hybrids, thus partially accounting for the lack of material. However, there are traces of yellow, cream, or straw-color in the outer petals of most of the species. The flowers are mostly large and showy, either night (nocturnal) or day blooming (diurnal), often fragrant particularly at night. In structure, the flowers are close to those of a *Cereus* possessing a flower tube that is long and slender.

The plant is characterized by long, flattened, leaf-like joints, generally with a distinct woody midrib and lateral ribs leading to the flowering areoles. Occasionally some of the joints are thick and three-angled, especially in the young stages of growth. The margins are usually boldly crenate (scalloped), with the small, spineless areoles in the notches between. Often the whole joint is distinctly wavy. The presence of spines in mature plants is generally the result of some intergeneric cross, although seed-





FIG. 113. *E. phyllanthus* showing ridged fruit.

lings of most of the true or wild species are quite spiny.

In 1753 one of the first species to be collected was *Epiphyllum phyllanthus*, native from Panama to Brazil, with bright green

joints, hardly indented, about two inches wide with prominent midrib and purplish-red margins, the lower joints becoming round and woody. The flower tube is slender and the longest (12 to 13 in.) of any of the species. The corolla is comparatively small, greenish-white, shading to pure white at the center. They are fragrant and night blooming. This, and some of the other species, are called "Flor de Baile" (flower of the dance) in Latin America.

*Epiphyllum oxypetalum* (well known as *Phyllocactus latifrons*), is widely cultivated in the tropics and is one of our popular "Night blooming Cereus" house plants. The branches are up



FIG. 114. *E. oxypetalum* is grown throughout the world as a house plant—usually called "The Night Blooming Cereus."

to 9 feet long with thin joints with a horny margin and deep crenations and wavy edges. The flowers are long and stout with a reddish tube having a few narrow scales about  $\frac{3}{8}$  in. long. The narrow outer petals are reddish-brown color, while the inner ones are pure white and wider. The flowers open about 10 p. m. and close very early the next morning. The style and stamens

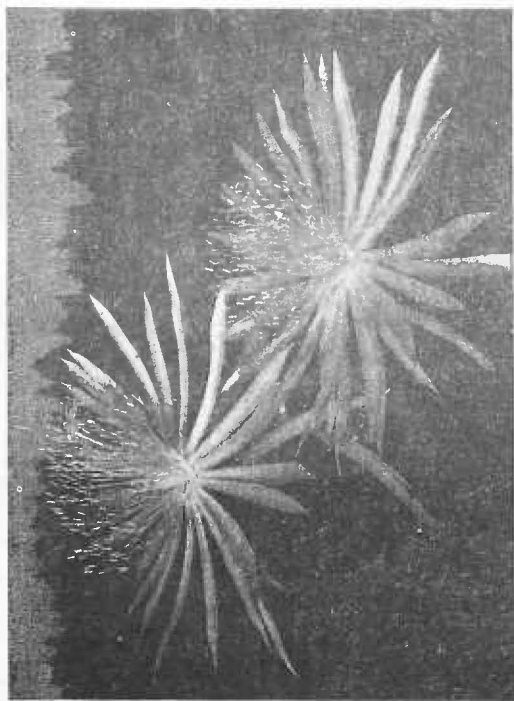


FIG. 115. *E. strictum* has a distinct flower and should be in every collection.

are white. This is the parent of many hybrids. In Europe there was a variety which was called *E. grandis*, from Honduras, with 9-in. fragrant flowers; this may be our *E. oxypetalum*. They also listed *E. purpusii* from Mexico as being similar except with some



FIG. 116. Branches of *E. crenatum*.

rose color in the petals. *E. latifrons* was described with ribbon-like branches less regularly pinnate, and flowers with a rose-colored style; it was found in Vera Cruz, Mexico. Britton and Rose listed these three as synonyms. Some of the hybrids of this parentage are: *Londonii*, *Maurantianus*, *Mexicanus*, *Roseus albus*, *Roseus superbus*, *Selloi*, *Smoli*, and *Smithii*.

*E. strictum* is upright in habit. It has long, narrow joints, with bold, regular crenations and medium-sized flowers, shading from pink in the outer petals to white in the inner ones. *E. stenopetalum* is somewhat similar, but has wider, flexible joints. The flowers possess very narrow petals. The style is red or pink and makes a beautiful effect with its yellow stigma lobes surrounded by the upright stamens. This species is quite common in collections and is a dependable plant for flowers in midsummer.

*E. crenatum* has joints that widen out from a round stem-like base to a flat leaf-shape about 2 inches wide, 2-3 feet long, coarsely and regularly scalloped. They are rather thick and



FIG. 117. *E. stenopetalum* has large branches and was used quite generally in hybridizing.

stiff, with a strong midrib. Towards the edges they are bevelled off to a sharp degree. The areoles sometimes contain small three-cornered scales. The day blooming flowers are fairly large, slightly fragrant and remain open for several days. This species is one of the parents of many hybrids, including *Elegans*, *Erleri*, *Haageanus*, *Roseus*, *Splendens*, *Superbus*, and *Vogelii*.

*Epiphyllum stenopetalum* was described by Foerster in 1846 as a native of Oaxaca, Mexico, but is now considered to be a doubtful species. It was lost for a long time, the last record being made by Salm-Dyck in 1849, until A. Purpus found the plant near Zacuapan in the state of Vera Cruz in 1908; it flowered in the Botanical Garden in Darmstadt. It grows upright, branching from the ground, has leathery, dull, yellowish green branches with horn-like borders. The original description gives its habit

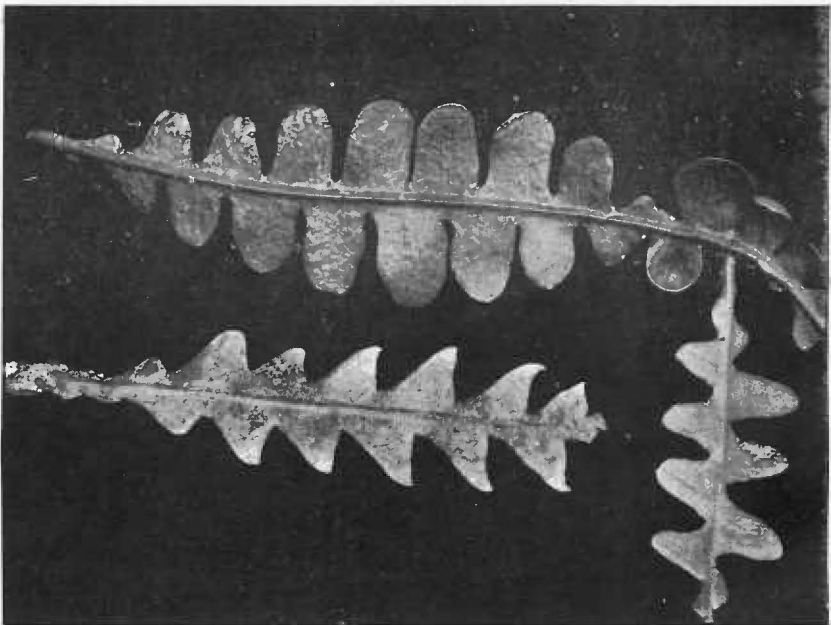


FIG. 118. Branches of *E. anguliger* (below) and *E. darrabii* (above) collected by T. Macdougall.

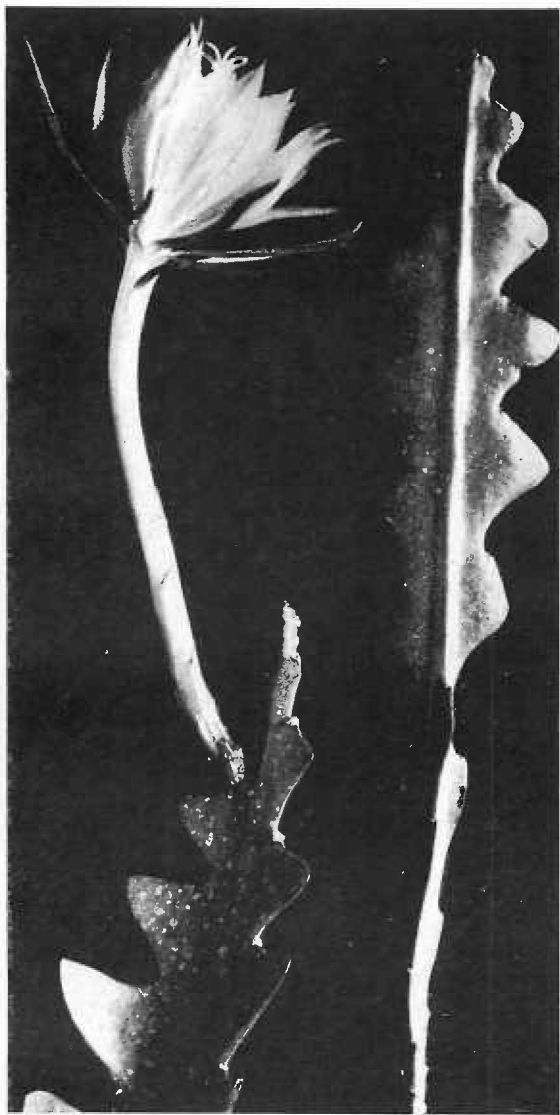


FIG. 119. *E. darrabii* as shown in Britton and Rose,  
"The Cactaceae."



FIG. 120. An early drawing of *E. darrabii* from Schumann.

as similar to *E. latifrons* (*E. oxypetalum*) but with a different flower. The outer petals are rose-colored to reddish green; inner petals white, very pointed, narrow (linear, elongated) about one-quarter inch or less, and three inches long. The style is red. Makes a fine basket-type plant.

*E. darrabii* was named after Charles Darrah, a great collector of Manchester. It is easily recognized by the deep, coarse, round-



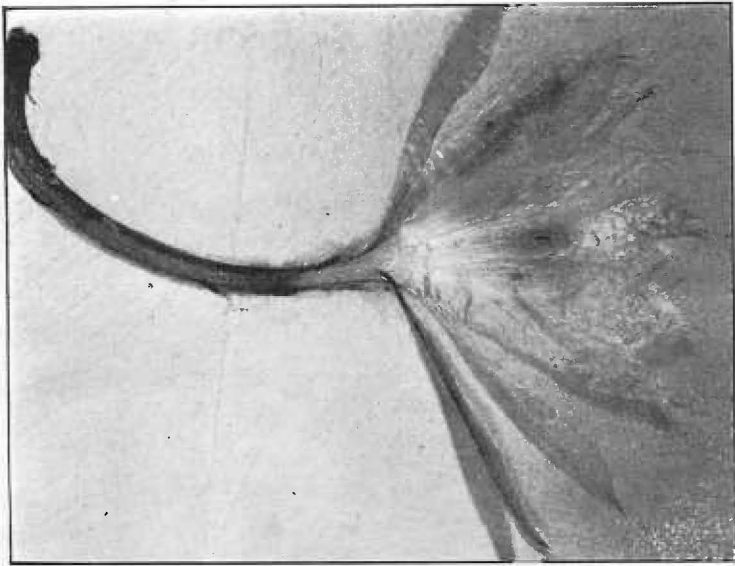


FIG. 121. Pressed flower of *E. darrahii*  $\frac{2}{3}$  size. Courtesy of Mr. T. MacDougall.

ed lobes of the glossy, yellow-green branches, indented almost to the midrib. The flowers are of medium size with a long slender tube with few scales. The outer petals are quite lemon-yellow blending to white in the inner petals. Native of Mexico.

*E. anguliger*, also from Mexico, is quite similar to the foregoing and is easily confused with it when in juvenile growth, but the branches have sharp, saw-toothed lobes pointing forward. Like *E. darrahii* the flowers have a honeysuckle fragrance, but the shorter tube has no scales and the outer petals are brownish yellow. Both species flower quite easily in late summer.

*Epiphyllum bookeri* is a tropical species from South America and grows fast in warm weather but is quite tender to frost. It was first described as native to Brazil but its distribution is Tobago, Trinidad, and northern Venezuela. It forms great masses in trees and on coastal cliffs, ascending the trees to a length of thirty feet, much branched and very floriferous. The branch

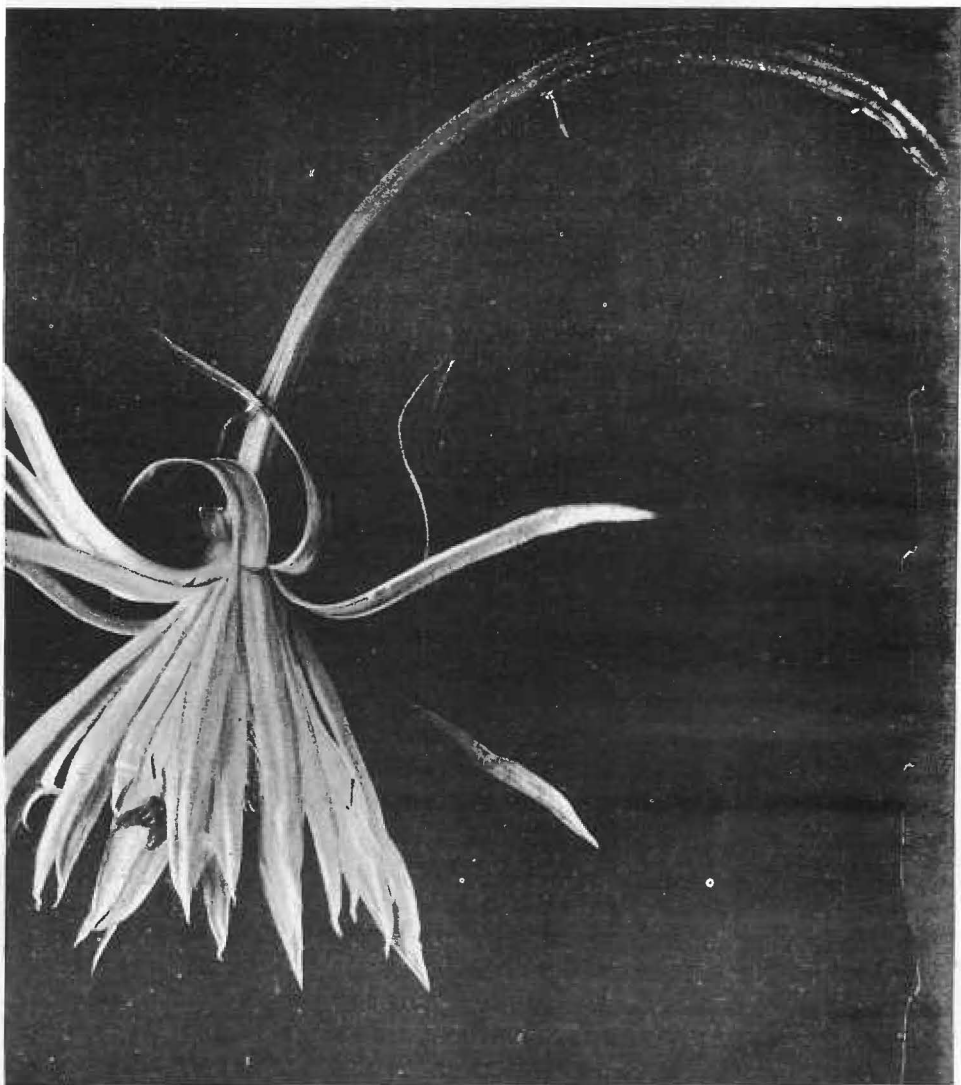


FIG. 122. *E. bookeri* from the West Indies.



FIG. 123. An early drawing of *E. macropterum*  
(formerly called *Phyllocactus thomasiannus*).

form is quite variable, often 3-winged. The tube is slender and much longer than the petals. The outer petals are greenish to rose-colored while the inner petals are narrow and pure white. This species has often been confused with *E. phyllanthus*. It is available from dealers.

*Epiphyllum macropterum* from Costa Rica has day flowers which come out on the under side of the branch and lay appres-

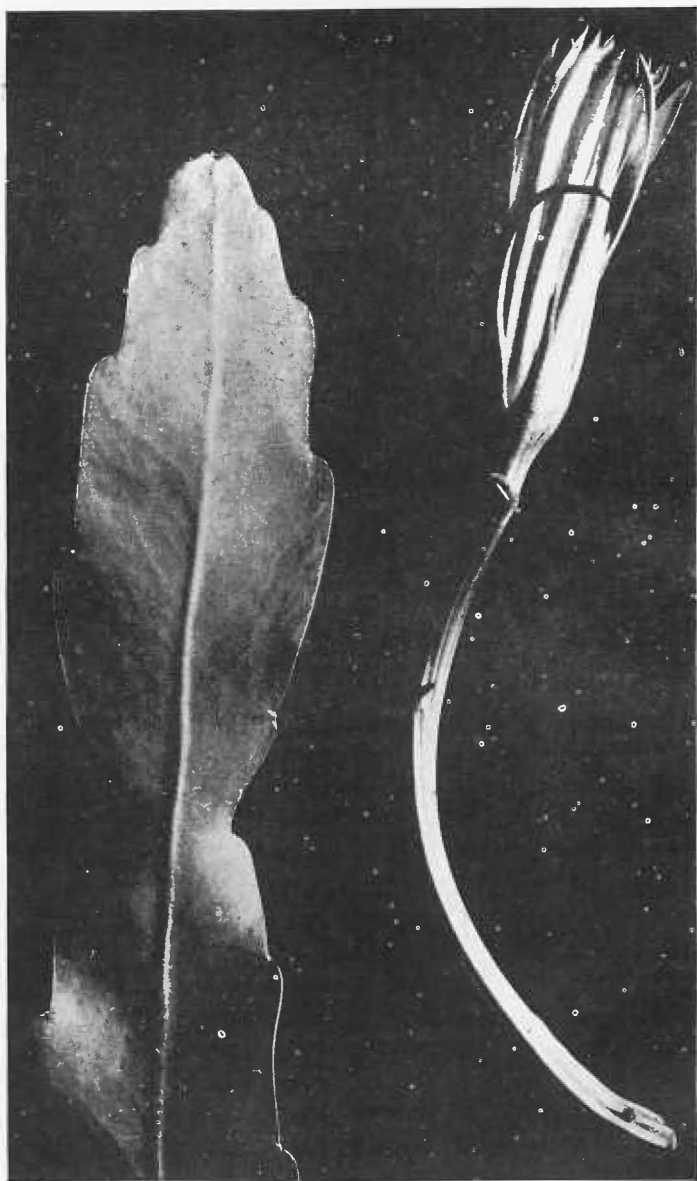


FIG. 124. *E. guatemalense* from Costa Rica.

sed to it instead of standing outward as in other species of the genus. The plants have long branches with horny margins. The flowers are large with a curved tube as in *E. oxypetalum*. They have wide white inner petals enclosed with narrow outer petals, salmon-colored or with yellow tips. This is one of the finest and is an old species, being first described by Lemaire in 1864 as *Phyllocactus macropterus*; Schumann also used the name *P. thomasiensis* for this species.

*Epiphyllum guatemalense*, also from Costa Rica, is distinct with its very broad, leathery, gray-green branches. It makes a fine basket type. Dealers have listed this as having small white flowers, yet the botanical descriptions give the tube as 6 inches long and the flowers having 3-inch petals. The outer petals have a trace of red but the inner, narrow ones are pure white.

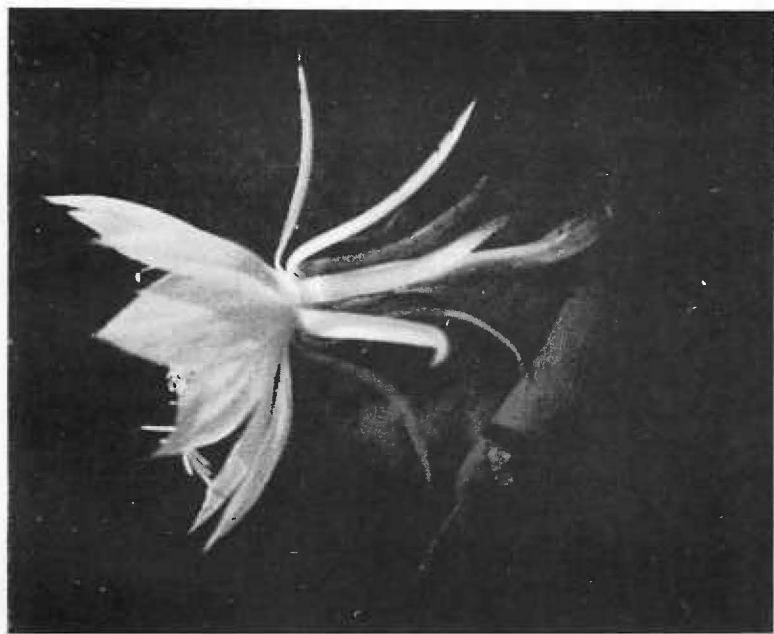


FIG. 125. *E. pumilum* as flowered by Mr. T. MacDougall.  
Photograph approximately natural size.

*Epiphyllum pumilum* from Guatemala (Mr. T. Macdougall also collected it in Oaxaca, Mexico) has been described as possessing flat or whip-like branches up to fifteen feet long. The margins are slightly indented. The flower is smaller than *E. strictum* and is often confused with *E. pittieri* except that the style is always white.

*Epiphyllum pittieri* has more coarsely toothed branches than the foregoing with miniature strictum-type flower, and is one of the smallest of the genus. The style is white towards the tip and shades to purple and red near the base. The plant is native to Costa Rica and flowers in January and again in the summer. It is not common in collections.

*Epiphyllum cartagense* from Costa Rica is a poorly defined species and needs further checking. It seems to have a combination of the markings of several flowers—white with outer petals pink to yellow, turning black as they wither. In Costa Rica it is called "plantanillo de monte."

*Epiphyllum caudatum* was recognized as a species by Britton

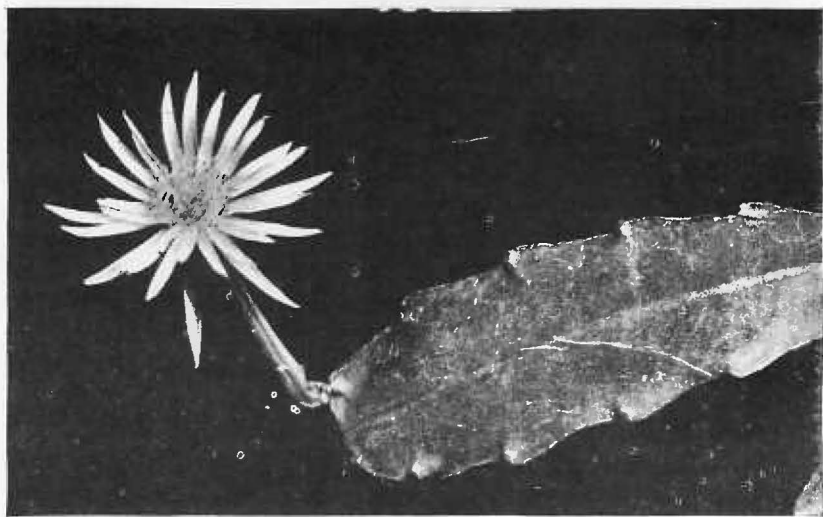


FIG. 126. *E. pittieri* has the smallest flowers of any of the species.

and Rose but this too requires further comparisons of collected plants. The crenations are not deep and the branches end in slender pointed growth. It is known only from Comaltepec, Oaxaca, Mexico.

*Epiphyllum lepidocarpum* was described by Weber in 1913 as *Phyllocactus lepidocarpus*. The flowers are small and they have red buds and reddish scales. The outer petals are a pale yellow and the inner petals are pure white. The plant on which the description was made came from near Cartago, Costa Rica.

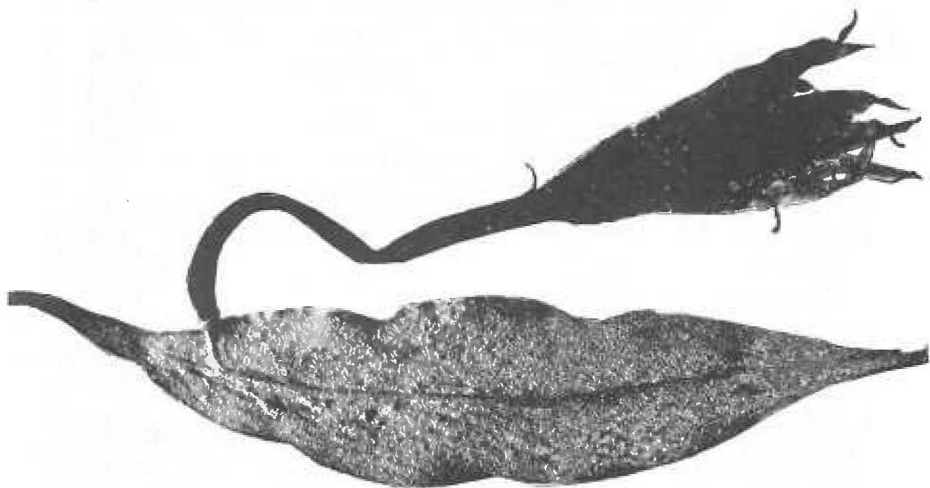


FIG. 127. Dried branch and flower of *E. caudatum*.

*Epiphyllum grandilobum* from La Honduras, Costa Rica, also is vaguely described. Weber states that it is a remarkable species with its thick mid-vein and deeply lobed margins. The night flowers are 5 inches across, strictum-type, and with a spicy fragrance. The pistil is pale pink, almost white. Mrs. Place reports that the new branches, in her garden, are weak with slight crenations; the tips curve inward.

*Epiphyllum ackermannii* has been treated as a true species by some botanists while others have believed it to be a hybrid. In



*Phyllocactus Ackermannii* S.D.

FIG. 128. Drawing of *E. ackermannii* from Schumann. The true species is not common in collections.

1829, Haworth described it from supposedly wild plants collected by Ackermann in Mexico. Later it was considered a natural hybrid, and because of its red flowers, was believed to be related to *Heliocereus*. Mr. Ferdinand Schmoll of Mexico states that this conclusion is impossible because the habitats are not the same; also, he observed that seeds all germinated true, which fact is not so with hybrids.

In 1940 the late Dr. R. W. Poindexter listed *E. ackermannii* as having "triangular stems." This may be due to a confusion with *Heliocereus cinnabarinus* or a cross between them.

At the time Britton and Rose published their monograph it had not been recollected, thus it was treated as a hybrid. Helia Bravo, in her book "Las Cactaceas de Mexico" of 1937 states that *E.*



*ackermannii* is found growing in the woods at Veracruz in the state of Orizaba. Mr. T. MacDougall also secured a cutting from Jardin Lecuono, Bandevilla, V.C., in 1941, that proved to be the true species; he also has observed this plant along the highway above Jalapa, and also near Xuchiles along the railroad between Cordoba and Tierra Blanca.

In the July, 1944, "Cactus and Succulent Journal," Charles L. Gilly, Sr., of the New York Botanical Garden redescribed *E. ackermannii* Haw. as a true species thereby clarifying it for all time. The plant was collected in a canyon less than a mile from the city of Jalapa where it was observed in bloom in February, May, and August.

In the "Cactus and Succulent Journal," November, 1945, Mr. T. MacDougall says, "The Britton and Rose key does not admit *E. ackermannii* into *Epiphyllum*. Plants of *E. ackermannii* and *Nopalxochia phyllanthoides* are certainly very much alike and indicate close affinity between the two species. However, flowers observed on *E. ackermannii*, from the Jalapa district in Veracruz, have been nearly rotate, and, on this basis, with the system of classification now in use, *E. ackermannii* perhaps should be in a monotypic genus. My impression is that true *E. ackermannii* is almost unknown under cultivation in the United States."

Mr. Gilly describes the thin, flat branches as being about 12 inches long and  $1\frac{1}{2}$  inches wide with a prominent midrib, and crenations  $\frac{3}{4}$  to  $1\frac{1}{2}$  inches long and averaging about  $\frac{3}{8}$  inches deep, medium to apple green. The young growth is nearly cylindrical or 4-angled with spine-clusters at the areoles. The flowers are diurnal, with several opening at one time on a single branch. The short flower tube excludes it from the genus *Epiphyllum* which requires the tube to be longer than the limb. The number of inner petals is 16 to 30, opening to about 6 inches wide, of a bright vermilion to orange-vermilion, each petal at least  $4\frac{1}{2}$  inches long and  $\frac{5}{8}$  inches wide, midrib area paler and yellower in color. The flower tube is about 2 inches long, apple green, sometimes flushed with red, with prominent ridges with scattered

scales. The outer petals vary in color from apple green to entirely vermilion, not far spreading from the inner petals. The 75 to 100 stamens are attached in four distinct ranks, the longest being about 3 inches long. The thread-like filaments are pale greenish-white at the base, gradually shading below the middle into rose-vermilion. The anthers are white except sometimes pink at the tips. The style is whitish at the base but the same color as the inner petals for most of its length, slightly longer than the stamens. There are usually 10 stigmas, but sometimes as many as 16, at first white and later changing to grayish rose-red. The fruit is unknown.

The length of the entire flowering period is as yet unknown but we can see its effects in crosses where the flowers last several days. In cultivation the color of the hybrids is variable depending on position, temperature, and foods. It is richer or deeper when the flower first opens and fades with age. There is a variety in cultivation, under various names, which has a deeper color.

Mr. Gilly makes no mention of bristles in the areoles of older growth whereas Haworth says, "areoles felted, often bristly or with weak spines." Salm-Dyck's illustration in Schumann's "Bluehende Kakteen" also shows bristles in the areoles.

This Epiphyllum, or more probably its hybrid, is well known as a house plant in homes all over the world and may be called "King of Epiphyllums." It seems to thrive in all kinds of soil and cultural conditions, perhaps because the owner does not know it is a cactus and therefore supplies it with good soil and plenty of moisture. It flowers profusely and is the first to bloom in the spring as well as at other times during the summer and winter. It will stand considerable sun but the flowers will not last as long or have as deep a color as when grown in partial shade.

*E. ackermannii* is a favorite as a parent for hybrids because of its hardiness, its long flowering period and well lasting flowers, and its adaptability to basket or hanging-pot culture. We are glad that it has finally been acknowledged as a true species and await its new classification after more field work has been completed among the Epiphyllanae.

## CLASSIFICATION

Classifications of the Epiphyllanae have been presented by many taxonomists but none have been accepted without change. In fact, the classifications are constantly changing as new plants are discovered or more exact descriptions are made. The recent introductions of new Epiphyllums point to more revisions within the next few years but it is hoped that no hasty reclassification will be made until all of the existing material has been checked. Within recent years, many fields have been opened for exploration and before long all habitat areas may again be explored. Without living material from definite localities, classification will continue to be based on second-hand information.

For comparison and study, the translations of Schumann's and Berger's keys as well as that of Britton and Rose, follow:

Classification of Prof. Dr. K. Schumann in "Gesamtbeschreibung der Kakteen" (1898) and "Nachtrage" (supplement 1898-1902).

### Genus: PHYLLOACTUS Link

*Epiphyllum* Haw.  
*Phyllanthus* Neck.  
*Disocactus* Lindl.  
*Disisocactus* G. Kunze  
*Phyllocereus* Miq.

The flowers are usually funnelform, with elongated tubes, shortened tubes, or the ends close together bell-shaped. The ovary is usually angled, sometimes winged, mostly scaled, seldom naked, never possessing prominent wool-cushions, bristles or spines. The petals are one- or two-colored. The stamens are enclosed, either inclined below or diverging above. The fruit is red, usually scaled or retaining the scars left by the fallen scales. The shining black seeds are inversely ovoid and finely pitted. The hook-shaped embryo has appressed cotyledons.

At first always upright, epiphytic succulents with rigid erect, or hanging, jointed branches, which sometimes clamber with the aid of roots. The seedlings have always a cereus-like, angled appearance; similar growths sometimes appearing later at the base; therefore all transitions between angled and leaf-like joints are found. Branches often of two forms—round

ed stems and long, two-edged, flattened branches; the shorter (sometimes however, 3 feet long), leaf-like, more or less crenate branches are produced from the terete stems. Areoles in the crenations have triangular compressed scales, in whose axils are a little wool-felt and especially in youth a few bristles, never heavy spines. Flowers usually from the upper part of the branch, sometimes directly at the tips. Fifteen species are found in the tropics of America.\*

Remarks [1898]. The following is to be noted relative to the nomenclature of the genus. If one adheres strictly to the established principles of priority the name *Phyllocactus* must be abandoned, since it was first proposed in 1831 by Link. The older name, *Epiphyllum*, of Haworth (1812), corresponds exactly to the genus as set up by Link. From this, Pfeiffer took out *E. truncatum* and set it up as a new genus, which differed from that of Haworth, based upon the irregular form of the flowers. This caused me at the time (in the "Flora Brasiliensis"), as the standpoint of priority plainly indicated, to follow the use of the latter and to retain the Haworth name for the largest part of the genus. I therefore was required to create a new generic name for *Epiphyllum truncatum* and called the plant *Zygocactus truncatus*. Later I convinced myself, in close harmony with experienced persons, of the disadvantage of retaining the prior name instead of the one long in use for these cultivated plants. For that reason I re-established the name *Phyllocactus*, allowing *Epiphyllum* to remain in the sense of Pfeiffer. The name *Phyllocereus*, created in 1839 by Miquel, has no authorization. Only *Phyllarthus* remains, which Necker created in 1791. I am of the opinion that this name deserves no consideration, since it is entirely unfounded. He gives no species upon which *Phyllarthus* is to be based, but only says at the conclusion of his diagnosis, that one or a few species of Linne's genus *Cactus* belong here. This does not satisfy me, involving as it does such an important revolutionizing of nomenclature. Besides, another condition for refusal occurs to me: *Phyllarthus* might easily be a misprint for *Phyllanthus*; probably Necker's imperfect knowledge of ancient languages is to blame for this deformed name. *Phyllarthus* (he also incidentally writes it *Phylarthus* in the index) cannot be expressed in Greek (*phyllon* means indeed "leaf"), but *arthus* does not exist in Greek—there are only the similar words *artos* "bread" and *arthron* (joint).

### Sub-family III: CEREOLIDEAE K. Sch.

#### Tribe I: RHIPSALIDEAE K. Sch.

#### Genus IV: PHYLLOCACTUS Lk.

\*Note that Schumann made no comment on the lengths of the limb and tube. Ed.

## I. Section EUPHYLLOCACTUS K. Sch.

[As revised in "Nachträge" 1898-1902]

A. Branch rounded or pointed at the end, never tapering to a slender point.

a) Stamens white.

a) Style white.

I. Ovary lengthened, set with numerous spreading or reflexed scales. .... 1. *P. lepidocarpus* Web.

II. Ovary set with few small scales.

1. Branch leather-like, very large. Plant very strong, with thick, terete main stems. Tube of the red flower set with short scales. .... 2. *P. grandis* Lem.The following is also distinguished through the large size of the fruit (6 inches long, 2 inches in diameter) ... 3. *P. macrocarpus* Web.2. Branch thicker, crenate and sharp at borders. Tube of the yellow involucre set with long scales. .... 4. *P. crenatus* Lem.Here also belongs the perhaps identical ... 5. *P. caulorrhizus* Lem.3. Branch strongly serrate or saw-toothed.  
\* Branch thinner, leather-like. Flower with thinner tube, exterior citron-yellow. .... 6. *P. Darrahii* K. Sch.\*\* Branch thick. Flower with thicker tube, exterior reddish-yellow. .... 7. *P. anguliger* Lem.4. Branch extraordinarily large and broad, split up into long-lineal lobes. .... 8. *P. grandilobus* Web.III. Ovary without scales, berry weakly ribbed. .... 9. *P. Costaricensis* Web.

aa) Style red.

I. Stamens only at the base of the petals, forming a radiating crown.

1. Branch very stiff. Flower hanging and curving upward, 8 inches long and more, outside greenish, 4 inches in diameter. .... 10. *P. strictus* Lem.2. Branch less rigid, but upright. Flowers upright, mostly 8 inches long and more, outside yellowish-green, 2 to 2½ inches in diameter. .... 11. *P. phyllanthus* Lk.3. Branch weak, not seldom hanging. Flower shorter, 4 to 5 inches long, outside green, 2½ to 3 inches in diameter. .... 12. *P. Pittieri* Web.

II. Stamens forming a second rank attached to the tube below the radiating crown of the stamens.

1. Outer petals whitish-green, red, pointed, broader. .... 13. *P. Hookeri* S.-D.2. Outer petals rose-red, very narrow. .... 14. *P. stenopetalus* S.-D.  
In this group also belongs without a doubtb) Stamens yellow. .... 15. *P. Cartagensis* Web.B. Branch long and tapering to a point. .... 16. *P. Thomasianus* K. Sch.17. *P. acuminatus* K. Sch.

## II. Section ACKERMANNIA K. Sch.

- a. Perianth dark scarlet to carmine,  $4\frac{1}{2}$  inches and more in diameter, style carmine..... 18. *P. Ackermannii* S.-D.
- b. Perianth rose or yellowish-red, sometimes darker streaked, hardly 3 inches in diameter, style white... 19. *P. phyllanthoides* Lk.
- 1. Ovaries cylindrical, not winged, petals few, about 8.

## III. Section DISISOCACTUS K. Sch.

- 2. Ovaries five-angled, winged, petals more than in the above, fewer than in the first section. 20. *P. biformis* Lab.

## IV. Section PSEUDEPIPHYLLUM K. Sch.

- Flowers scarlet, joints at the ends more or less, sometimes very strongly bristled..... 21. *P. gaertneri* K. Sch.

## Genus V: EPIPHYLLUM K. Sch.

- A. Flowers clearly zygomorphic, two-lipped, branches sharply serrate; ovary terete.
  - a) Serrations 2 to 3, triangular; flowers strongly zygomorphic, carmine..... 1. *E. truncatum* Pfeiff.
  - b) Serrations 3 to 4, subulate, acuminate; flowers somewhat less zygomorphic, white with only a pink cast ..... 2. *E. delicatum* N. E. Br.
- B. Flowers barely or not at all zygomorphic, branches weakly and bluntly serrate, ovary angled.
  - a) Flowers barely zygomorphic, to 3 inches long, branches to 2 in. long and  $\frac{3}{4}$  in. broad..... 3. *E. Bridgesii* Lem.
  - b) Flowers not zygomorphic, 2 in. long, branches 1 in. long to  $\frac{3}{8}$  in. broad..... 4. *E. Russellianum* Hook.

Britton and Rose's classification in "The Cactaceae" (1923).

### Sub-tribe: EPIPHYLLANAE

Mostly epiphytic and night-blooming cacti, generally growing on trees, but sometimes on the earth when this is rich in humus, rarely in the crevices of rocks, much branched, spineless (except *Eccremocactus* and some species of *Epiphyllanthus*); joints several or many, usually flat except at base, often thin, with the areoles borne along the margin (except in *Epiphyllanthus*); flowers regular (except in *Zygocactus* and *Epiphyllanthus*); perianth various; filaments usually long and slender; style long and slender; fruit spineless, usually red or purple, either naked or bearing a few scales (rarely many), these usually with naked axils; seeds small, black.

We recognize 9 genera, diverse both in the plant-body and in the flowers. While apparently not closely related among themselves, the genera forming this subtribe are not any more closely related to other genera, either in the *Cereanae* or in the *Rhipsalidanae*.

#### KEY TO GENERA

Plants branching dichotomously.

Perianth irregular.

Joints thin and leaf-like with toothed margin; areoles all marginal ..... 1. *Zygocactus*  
 Joints thick, without teeth, bearing areoles all around. .... 2. *Epiphyllanthus*

Perianth regular or nearly so; joints thin. .... 3. *Schlumbergera*

Plants branching irregularly.

Perianth-segments spreading or reflexed; flowers mostly large.

Tube of flower definitely longer than limb. .... 4. *Epiphyllum*

Tube of flower not longer than limb.

Perianth campanulate, its segments few.

Stamens few; flowers small. .... 5. *Disocactus*

Stamens many; flowers large. .... 6. *Chiapasia*

Perianth short-funnelform, its segments many.

Outer perianth-segments short, obtuse or rounded, the inner white. .... 7. *Eccremocactus*

Outer perianth-segments acute or acuminate, the inner rose or red. .... 8. *Nopalxochia*

Perianth-segments erect; flowers small. .... 9. *Wittia*

#### Genus: EPIPHYLLUM (Hermann) Haw. (1812).

*Phyllocactus* Link, Handb. Erkenn. Gewächse 2: 10. 1831.

*Phyllocereus* Miquel, Bull. Sci. Phys. Nat. Néel. 112. 1839.

Plants mostly epiphytic, the main stem often terete and woody; branches usually much flattened, often thin and leaf-like, sometimes 3-winged; areoles small, borne along the margins of the flattened branches; spines usually wanting in mature plants, but often represented in seedlings and juvenile forms by slender bristles; true leaves wanting; cotyledons rather large, sometimes persisting for a long time; flowers usually large, in some species nocturnal, in others diurnal, either odorless or very fragrant; flower-tube longer than the limb, in some species greatly elongated; filaments usually long, borne at top of tube or scattered over surface of throat; style elongated, white or colored; stigma-lobes several, linear; perianth soon dropping from the ovary; fruit globular or short-oblong to narrowly oblong, often with low ridges, sometimes tubercled, red or purple, edible or insipid, when mature splitting down one side and exposing the white or crimson pulpy interior; seeds black, shining.

## KEY TO SPECIES

- A. Perianth-tube 7 to 9 times as long as the limb. .... 1. *E. phyllanthus*
- AA. Perianth-tube  $1\frac{1}{2}$  to 3 times as long as the limb.
- B. Ultimate joints acuminate.
- Flowers 11 in. to 12 in. long. .... 2. *E. oxypetalum*
- Flowers 4 in. to 6 in. long.
- Margins of joints crenate. .... 3. *E. pumilum*
- Margins of joints undulate. .... 4. *E. caudatum*
- BB. Ultimate joints acute, obtuse or rounded.
- C. Joints deeply lobed.
- Joints  $\frac{3}{4}$  to  $2\frac{3}{4}$  in. broad.
- Lobes of joints spreading; outer perianth-segments lemon-yellow. .... 5. *E. darrabii*
- Lobes of joints pointing forward; outer perianth-segments reddish yellow. .... 6. *E. anguliger*
- Joints very large, up to 11 in. broad. .... 7. *E. grandilobum*
- CC. Joints crenate or nearly entire.
- D. Joints deeply crenate, thick; perianth-tube bearing foliaceous scales. .... 8. *E. crenatum*
- DD. Joints low-crenate to nearly entire; perianth-tube without foliaceous scales.
- E. Sinui of the joint-margins very narrow; flowers up to 8 in. broad; stamens yellow. .... 9. *E. macropteryum*
- EE. Sinui of the joint-margins open; flowers 6 in. wide or less; stamens not yellow.
- Ovary and fruit bearing linear scales. .... 10. *E. lepidocarpum*
- Ovary and fruit without linear scales.
- Flowers 4 in. to 5 in. long. .... 11. *E. pittieri*
- Flowers 6 in. to 11 in. long.
- Flowers about 11 in. long; style orange. .... 12. *E. guatemalense*
- Flowers 6 in. to 10 in. long; style white or pink.
- Joints very stiff. .... 13. *E. strictum*
- Joints flexible or moderately stiff.
- Joints very large, up to 3 ft. long and  $5\frac{1}{2}$  in. wide. .... 14. *E. stenopetalum*
- Joints smaller, rarely ever  $2\frac{3}{4}$  in. wide.
- Joints shallowly crenate or subdentate; species of Costa Rica. .... 15. *E. cartagense*
- Joints deeply crenate; species of Tobago, Trinidad, and Venezuela. .... 16. *E. bookeri*



Alwin Berger's classification in "Kakteen" (1929).

Tribe I: RHIPSALIDEAE K. Sch.

Epiphytes or pseudoparasites growing upon trees and rocks, producing air-roots, rarely bearing spines. Stems jointed. Ovules on short umbilical cords.

Genus EPIPHYLLUM Haw. (1812).

Jointed, bushy plants; joints flat, 2-angled; areoles only on crenations and serrate edges and rounded ends; spines and flowers out of ends of joints; flowers large, brightly colored.

- a) Stamens in one group; ovary angled; flowers regular, stigma-lobes outspread ..... 1. EPIPHYLLOPSIS Berger

*Epiphyllum Gaertneri* K. Sch. (1890).

*Epiphyllum Russellianum* var. *Gaertneri* Regel (1884).

*Rhipsalis* Vaup. (1926).

*Epiphyllopsis* Berger (1928).

Joints  $2\frac{1}{4}$  inches long, up to  $\frac{3}{4}$  inch broad, blunt, about 5 indentations on each side; areoles bearing a few bristles, the terminal often with stout and long bristles, (for example, var. *Mackoyanum* W. Wats.). Flowers numerous, terminal  $1\frac{1}{2}$  to  $1\frac{3}{4}$  inch broad, scarlet-red, tube short; petals numerous, acute, spreading, somewhat recurved, stamens embedded at base, evenly long, red; style longer than stamens, white; stigma 5 to 6 lobed, long, radiating; fruit sharply 5-angled. Native to Eastern Brazil; St. Catherine. A much admired spring flowerer.

- b) Stamens in two groups; stigma-lobes united at the tip forming a ball.

\*Flowers more or less regular..... 2. SCHLUMBERGERA Lem. (1858).

*Epiphyllum Russellianum* Hook. (1839).

Joints lengthened or obovate,  $\frac{3}{4}$  to 1 inch long,  $\frac{3}{8}$  to  $\frac{3}{4}$  inch broad, edges having 1 to 2 indentations, bristles few; flowers 2 inches long, 1 to  $1\frac{1}{2}$  inch broad, tubular, more or less regular; ovary 4-angled; tube straight; petals about 20, acute, violet-rose; outer stamens 20, ten inner ones attached to ovary. Native to Eastern Brazil: in the Organ Mountains. Rarely found in cultivation.

\*\*Flowers irregular (zygomorphic)..... ZYGOCACTUS K. Sch. (1890)

*Epiphyllum truncatum* Haw. (1819).

Joints  $1\frac{1}{2}$  to 2 inches long,  $\frac{1}{2}$  to 1 inch broad, 2 to 4 sharp teeth on each side, the upper ones the larger; flowers  $2\frac{1}{2}$  to 3 inches long, rose-colored

to deep red and violet; ovary round; tube bent above the ovary; outer petals spreading, center vein pronounced, petals recurved; stamens and pistil exserted; inner group of stamens connected with fine deflexed membrane, the upper part free. Native to Eastern Brazil: Organ Mountains.

*Epiphyllum Altensteinii* Pfeiff. (1837) has strong, toothed joints; petals carmine-red. *E. delicatum* N. E. Br. (1902) has similar joints, lighter colored flowers; assuredly a variety. Beside numerous varieties in cultivation, there may be hybrids with *E. Russellianum*. *E. Bridgesii* Lem. (1861). (Syn. *E. Rueckerianum* Hort.) has few toothed joints; flowers slanting, less outspread; ovary angled; and may be such a hybrid. All of these *Epiphyllums* flower in midwinter and are universal favorites for house-plants. When the terminal joints are mature, in August and September, they should be kept dry, even to the wilting point. At that time the flower buds are formed on the terminal ends of the joints, like small dots. From that time on they may be kept moist.

## Tribe II. CEREEAE Berger

Growth varying greatly; succulent; joints cylindrical or flat, lengthened or roundish; seeds usually attached to long umbilical cords; flowers large; growing in the earth; and epiphytic.

### Subtribe I. PHYLLOCTEAE Berger

Terminal joints flat, 2-angled, more or less crenate; areoles in the crenations with few or no spines; flowers more or less tubular, small to large; seeds on long umbilical cords; epiphytic.

#### KEY TO GENERA

Flowers small:

Petals short, little spreading..... *Wittia*

Petals longer, spreading, acute..... *Disocactus*

Flowers large..... *Phyllocactus*

### Genus WITTIA K. Sch. (1903)

Epiphytic, *Phyllocactus*-like plants: joints longish, leaf-like, crenate; flowers small, funnel-shaped; wine red; petals short, narrow; stamens in two dissimilar groups; ovary bearing small scales; no hair or bristles. Three species, but none in cultivation with us. They are *Wittia amazonica* K. Sch., Peru; *W. panamensis* Br. & R. (1913), Panama, Colombia; *W. costaricensis* Br. & R. (1919), Costa Rica.

### Genus DISOCACTUS Lindl. (1845)

*Disocactus* Kunze (1845)

Epiphytic; *Phyllocactus*-like plants; flowers small, red, diurnal; ovary

cylindrical, bearing few small scales; petals few, acute, united at base to short tube; fruit round to ovate. Two species.

*Disocactus biformis* Lindl. (1845).

*Phyllocactus* Lab. (1853).

Stems round, bent over at the tip, 8 to 20 inches long; areoles arranged spirally; lateral joints lanceolate, crenate, soft-fleshed, green, central nerve distinct; flowers on side of joint out of upper areoles; buds pointed, more or less bent upward,  $1\frac{1}{2}$  to 2 inches long; petals 8 to 9, acute, bright red; stamens and pistil slightly longer than petals, red; stigma lobes 4 or 5; fruit pear-shaped,  $\frac{1}{2}$  inch long, wine-red. Cultivated like *Rhipsalis*. Found in Honduras.

*Disocactus Eichlamii* Br. & R. (1913).

*Phyllocactus* Weingt. (1911).

Branching from base; joints penicillate at base, 8 to 12 inches long, 1 to 2 inches broad, bright green, deeply sinuate; flowers out of upper areoles, numerous,  $1\frac{1}{2}$  inch long, usually red; tube narrow, wider toward top, the petals only slightly open; stamens and pistil exerted; fruit round,  $\frac{3}{8}$  inch large, red. Native to Guatemala. Discovered in 1905 by Fr. Eichlam; introduced and described by W. Weingart. Blossoms freely; flowers beautifully colored. Likes warmth and moisture.

## Genus PHYLLOCACTUS Link (1831)

*Epiphyllum* Haw. Syn. Pl. Succ. 197 (1912).

Epiphytic cacti with terete or angled, long or short stems and leaf-like branches variously crenated. Areoles in the crenations, naked or setaceous, seldom spiny; flowers large; tubes prominent, often long and narrow; ovary scaly or almost naked; petals and stamens numerous; fruit rather large, often edible. About 20 species.

A. Tube about as long as petals.

a) Petals few, about 8..... 1. CHIAPASIA Br. & R. (1923)

*Chiapasia* Br. & R. (1923) as a genus.

*Phyllocactus Nelsonii* Vaup. (1913).

*Epiphyllum Nelsonii* Br. & R. (1913).

*Phyllocactus chiapensis* J. A. Purp. (1918).

Stems branching, rod-like, first upright, then pendant 2 to 4 feet long,  $1\frac{1}{4}$  to  $1\frac{1}{2}$  inches broad, crenate; flowers showy, near the tip,  $2\frac{3}{4}$  to 3 inches long, scentless, open for several days; tube green, the thickness of naked ovary, both about  $\frac{3}{4}$  inch long; flower linear-funnelform, petals

slightly recurved, carmine to violet-red; stamens numerous, reddish at base, white at top; style slender, pink; stigma lobes 5, white. Native to Mexico: Chiapas. Cultivated in hothouses, in hanging baskets. Imported by C. A. Purpus in 1913.

- b) Petals more numerous..... 2. ACKERMANNIA K. Sch. (1898)  
*Nopalxochia* Br. & R. (1923) as a genus.

◦ Day bloomers.

*Phyllocactus phyllanthoides* Link (1831).

Densely bushy; joints lanceolate, acuminate, bluntly serrate, tapering towards base, light green, often reddish, nerves distinct; flowers 4 inches long, bell to funnel-shape; ovary slender, hardly distinct from scale-covered tube; outer petals spreading, lanceolate; inner ones spatulate, rose-red outside, lighter inside; stamens and style white; stigma lobes 5 to 8, white; fruit elliptic, angled, 1 to 1½ inch long, green, later red. Native to Mexico or Colombia. Freely flowering, easily grown, desirable species known as Deutsche Kaiserin (German Empress). Introduced into Germany about 1651 by Hernandez; pictured by Plukenet in 1691.

*Phyllocactus Ackermannii* Salm (1842).

*Epiphyllum* Haw. (1829).

Joints lanceolate, deeply crenate, penicillate at base, sometimes like an oak leaf in circumference, dark green; flowers large, rather loosely formed, deep, dark red, outer petals acute, spreading, inner ones broader toward the top, blunt; stamens numerous, red; stigma lobes 8 to 10, dark red; tube slender, green, angled; bearing reddish, outstanding scales; spineless. Found in Mexico. Introduced in 1824 by George Ackermann but is now rare. Attractive species, confused by K. Sch., Br. & R., etc., with a hybrid produced some hundred years after the introduction of *Phyllocactus Ackermannii*, by crossing the latter with *Cereus speciosus*. This hybrid was produced in England and there grown. It is today the most common and widespread of all *Phyllocacti*, but never was specifically named. Some describe it as *Phyllocactus Ackermannii hybridus*. It has fleshy joints, sometimes 3-angled; flower tube thicker, white-felted; spines like those of *C. speciosus*. The seedlings have cereoid branches with white spines.

◦◦ Night bloomers.

*Phyllocactus Bradei* Vaupel (1913).

*Eccremocactus* Br. & R. (1913).

Joints thick, up to 1 foot long, 2 to 4 inches broad, crenate; areoles usually bearing short spines; flowers 2½ to 2¾ inches long, white, outer

petals fleshy, blunt, reddish; only slightly open, closing the following morning. Native to Costa Rica.

B. Tube longer than petals; flowers nocturnal .....3. *EUPHYLLOCACTUS* K. Sch.

*Phyllocactus phyllanthus* Link (1831).

*Epiphyllum* Haw. (1812).

Trunk many branched, 3 to 4 angled; joints, which later become woody, longish,  $1\frac{1}{2}$  to  $2\frac{3}{4}$  inches broad, thin, light green with red edges; flowers 10 to 12 inches long, tube long, slender; petals only  $\frac{3}{4}$  to 1 inch long, white, narrow, style reddish, stigma white; fruit 3 to  $3\frac{1}{2}$  inches long, somewhat ribbed, red. Native to Panama to southern Brazil and Paraguay (var. *paraguayensis* Web. 1898); also Bolivia and Peru. This species is more interesting than beautiful.

*Phyllocactus oxypetalus* Link (1943).

*Phyllocactus grandis* Lem. (1847).

Upright bush, 9 feet high and more; branches round; joints thin, long-pointed, almost pinnately branched; flowers more than 1 foot long,  $4\frac{3}{4}$  inches broad; ovary green, weakly angled, bearing short scales; tube with widely scattered scales, more or less curved, brownish, twice as long as the funnel-shaped perianth; outer petals narrow, acute, reddish; inner ones broader, lanceolate,  $3\frac{3}{4}$  inches long, pure white; stamens and style white; stigma lobes cream-colored. Native of Mexico and Brazil. With us it grows best planted in the ground in a temperate greenhouse.

*Phyllocactus Purpusii* Weingt. (1907).

Structure similar to foregoing, but joints more blunt; scales at base of flower resemble leaves, closely appressed and overlapping; outer and central petals carmine-purple; agreeably fragrant. Mexico: Orizaba. Collected and imported by C. A. Purpus in 1906.

*Phyllocactus latifrons* Link (1843).

Joints large, slightly sinuate, blunt at apex, green, with horny margins; flowers 6 inches broad, tube about as long, angled, green or red-brown; outer petals lineal, rose-colored; inner ones broader, outside greenish edged with weak rose-color; inner ones white; style red; stigma lobes 8, yellow. Mexico.

*Phyllocactus stenopetalus* Salm (1850).

Habit and joints like *Phyllocactus latifrons*; flowers last only one night; disagreeably scented, 10 inches long; tube  $5\frac{1}{2}$  to 8 inches long, bearing a few reddish scales; perianth segments few, outer ones whitish-green;

inner ones white, narrow, 2 to 3 inches long,  $\frac{1}{8}$  inch broad; stamens white; style long, slender, carmine-red; stigma lobes 12-14, golden-yellow. Mexico: State of Vera Cruz, in forests at Zacuapan.

*Phyllocactus Thomasianus* K. Sch. (1895).

Large bush; joints weakly bent, longish or lanceolate, mostly blunt, light green, 16 inches long, 2 to 3 inches broad, slightly depressed areoles which are 1 inch apart; flowers 12 inches long, diurnal, fragrant; ovary cylindric, bearing short, broad, 3-angled scales; tube reddish toward top, bearing numerous dark red scales; perianth funnel-shaped, 6 to 8 inches broad; outer petals lineal, acute, under side reddish with yellowish upper side; inner petals spatulate, clear white or slightly yellow; filaments chrome-yellow, anthers brownish; style white; stigma lobes 14, yellow. Central America. Long cultivated. The flowers are tri-colored, underside of outer petals red, upper side yellow, inner petals white. *Phyllocactus macropterus* Lem. (1864) has horny-rimmed joints up to 6 inches broad; areoles  $1\frac{1}{2}$  to  $2\frac{1}{2}$  inches apart; large flowers. Costa Rica.

*Phyllocactus strictus* Lem. (1854).

About 6 feet high, joints lineal, first light green, later bluish-green, crenate edges; joints tinted with red, later woody; flowers last only one night, 10 inches long; ovary and tube bear a few scales; flowers about 4 inches broad or more, outer petals narrow, lineal, acute, light green or brownish; inner ones narrow, lanceolate, pure white; style rose-red toward top; stigma lobes 10 to 12, yellowish. Guatemala, Honduras.

*Phyllocactus Ruestii* Weingt. (1914).

Stems 3 feet high, toward the top more or less 3-angled; areoles distant, usually bearing 1 short spine; joints lanceolate, stubby, dark green, leathery, slightly crenate, 20 inches long, 4 inches broad; areoles small; flowers about 11 inches long; ovary long-ovate, somewhat ribbed, bearing small, 3-cornered scales; tube light yellow, only  $\frac{1}{4}$  inch thick, below the corolla widened like a ninepin; scales widely separated, closer toward the top; outer petals overlap each other, they and those following are greenish-white; the inner in three or four rows, lanceolate, white; the innermost are  $\frac{1}{2}$  inch broad; stamens form a ring at base and are light yellow, three-fourths as long as petals; style longer, white; stigma lobes 10, yellowish, about  $\frac{1}{4}$  inch long, thin. Honduras. The species is named for Ruest of Hanover. Resembles *Phyllocactus strictus*.

*Phyllocactus crenatus* Lem. (1845).

Joints rather stiff and thick, abruptly narrower toward edges, lanceolate or broad-lineal, 24 inches long,  $\frac{1}{4}$  inch broad, somewhat gray-green;

notches below areoles are rounded; flowers  $8\frac{1}{2}$  inches long, delightfully fragrant; tube reddish toward top; outer perianth segments broad-linear, greenish-yellow; inner ones spatulate, white or cream-colored; stamens light yellow; style and 8-lobed stigma white. Honduras; Guatemala. A favorite decorative plant; much used for hybridizing.

*Phyllocactus Pittieri* Web. (1898).

Joints 12 to 16 inches long, 1 to  $1\frac{1}{4}$  inches broad, long crenations, drooping; flowers 4 to 5 inches long; ovary and tube slender, light green, bearing a few pointed scales; perianth star-shaped, 2 to 3 inches broad; petals 25 to 30, narrow, acute; outer ones green; inner ones pure white; stamens all attached at base and adhering to tube, short, white; style longer, white to pink; stigma lobes 10, spreading. Costa Rica. Flowers abundantly; hyacinth-like fragrance.

*Phyllocactus Hookeri* Salm (1842).

Grows rankly, often 30 feet high, climbing; joints light green, 2 to  $3\frac{1}{2}$  inches broad, wide apart, slightly crenated; flowers nocturnal without aroma; ovary angled and a few prominent scales; tube 4 to 5 inches long, slender, greenish, bearing few scales; outer petals narrow, greenish-red, rose-colored tips; inner ones clear white, 2 inches long, narrow, acute; stamens white; style yellowish at base, shading to carmine in middle and reddish at top; stigmas yellow. Northern Venezuela; Trinidad; Tobago. Often in large masses on rocks and trees. Introduced in England as early as 1825.

*Phyllocactus Darrabii* K. Sch. (1903).

Joints 8 to 12 inches long, 1 to 2 inches broad, rather thick, light green, deeply serrated, indentations rounded; flowers 7 inches long, delightfully fragrant; tube 4 inches long,  $1\frac{1}{2}$  inches thick, light yellow or greenish, few linear scales; perianth  $2\frac{1}{2}$  inches across; outer petals narrow, acute, citron-yellow; inner ones lanceolate, acute; clear white; stamens form a wreath at base, upright, white; stigma 8-lobed, white. Mexico. Also a favorite for pot culture.

*Phyllocactus anguliger* Lem. (1851).

Joints lanceolate, rather fleshy, green, middle nerve thick; roughly serrated, lobes more or less strongly angled; indentations are more or less deep and acute; flowers 6 inches long, agreeably fragrant; tube slender, green or flesh-colored, bearing few scales; outer petals narrow-lanceolate, yellowish flesh-colored; inner petals pure white, spatulate, acute, finely serrated; stamens, style and 8-lobed stigma white. Mexico. Flowers less often than foregoing but is quite similar.



FIG. 129. An artist's conception of one of the species, *Phyllocactus thomsonianus*. Many botanical drawings have been made without the live material and are gross exaggerations. Britton and Rose believed the above plant to be *Epiphyllum macropterum*.



## HYBRIDIZERS

From the botanical species many hybrids have been developed, using one of the true species as one parent and one of several related cacti as the other. The size and beautiful color of the flowers have resulted from the work of skilled gardeners and amateurs. Whereas the flowers of the true species of *Epiphyllum* are all white,<sup>1</sup> the foresight of hybridizers in recognizing the close relationship between *Epiphyllum* and species in certain related genera, has produced flowers of many other colors for the enjoyment of plant lovers.

Before discussing the hybrids themselves or the methods used in producing them it is interesting to see who were most active in their creation. The earliest records can be traced back to 1830 in England where Jenkinson and Smith recorded their first hybrids. They were followed by the gardener of Lord Liverpool and Pressley in 1832. At a later date following early German hybridizers, some English hybridizers were Sellow, the gardener of Walter Boyd, and the Baumann brothers.

Because of the great interest in horticulture in England at the beginning of the 19th century considerable time was devoted to plant breeding. About 1820 *Heliocereus speciosus* was introduced into collections shortly after *Nopalxochia phyllanthoides*<sup>2</sup> had been distributed. The ease in crossing these two plants led to many fine hybrids which were named and offered in the trade. The enthusiasm spread to France and Germany where most of the hybrids up to the year of 1850 were the result of crossing these two species.

Many transitions originated in the first hybrid generation through the combinations of these parents, which differed from

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<sup>1</sup> The recent inclusion of *Epiphyllum ackermannii* as a true species is the one exception.

<sup>2</sup> This was once known in Europe as *Phyllocactus phyllanthoides* and was changed by Britton and Rose to *Nopalxochia phyllanthoides*. This is our pink Kaiserin or German Empress and is not to be confused with the true species, *Epiphyllum phyllanthus*, which has large white flowers.

each other in more than one characteristic. Some had the habit of *Heliocereus*, while others were typically *Epiphyllum*-like. Those resembling the former in form, excelled in flowers with different shadings of red with or without the characteristic "blue-like iridescence" of the true species.

Among the hybrids, those which show more or less illusory similarities to the true *Epiphyllum ackermannii* are especially noteworthy. They were believed to be the results of crossing between *E. ackermannii* and *H. speciosus*, but this belief was never proven; only a very few plants of the true species of the former reached Europe and these were quickly lost, thus this species has played no great role in hybridizing. At any rate the predominance of *Heliocereus* and *Nopalxochia* hybrids out-classed any others.

Further development in hybridizing up till now had been confined within proportionately narrow limits, especially with regard to new flower colors. Even the named varieties of Foerster, 1846, according to testimony of contemporaries, hardly differed from each other in flower colors.

Then came a new plant to stimulate further hybridizing—the white and large-flowering, scented, *Epiphyllum crenatum*.<sup>\*</sup> It was imported into Europe for the first time in 1840, and was described in England in 1844 and in France in 1845. While the English descriptions of these imports were mindful of its exceptional worth for hybridizing, the true value of its possibilities was first realized by two French breeders, Charles Simon and Lorenzo Courant. Both were colleagues, Simon was a cactus gardener by profession while Courant, his client, at first bred *Epiphyllums* only as a hobby and later helped Simon in business, after his hybrids had won him distinguished prizes at flower shows. Both utilized the choicest of around 30 of the best *H. speciosus* hybrids to cross with *E. crenatum*. They obtained hundreds of new hybrids with large flowers of many color shad-

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<sup>\*</sup> European name—*Phyllocactus crenatus*.



FIG. 130. The delicate pink Gordonianus is evidently related to *E. crenatum*. The scales are exceptionally long in this old hybrid.

ings, from light yellowish white, rose shades to strong orange and deep amber, and in pure colors as well as shadings. It is probable that Simon also crossed *E. crenatum* with *Selenicereus grandiflorus* which resulted in *Pfersdorfii*, and with *S. pteranthus* which resulted in *Cooperi*. Through further crossing of these two hybrids with other *Epiphyllum* hybrids, the *Selenicerei* had thus



FIG. 131. Pfau is one of Bornemann's hybrids. Schumann shows it as magenta with bright colored scales.

added their bit to the colorful hybrids—mostly in flower characteristics.

In 1890 Johannes Nicolai became the first hybridizer in Germany. His originations were first hand and were not based on the further crossings of foreign hybrids. In his nursery near Dresden he turned to plant breeding, with especial stress on cacti,

using besides *Epiphyllums* also *Schlumbergera*, *Zygocactus*, and *Rhipsalis* species. However, he was not to see the results of his labor, he died at 41 years of age, in 1901. Nearly 300 named varieties were introduced into the trade by him as his own originations. Few, if any exist today because of his early death and the fact that even though his brother, Woldemar Nicolai took up his work, all but a few were lost by freezing due to the shortage of coal in Germany during World War I.

We owe to Woldemar Nicolai the fact that we have a fair knowledge of his brother's methods of hybridizing. The varieties of the French breeders he did not purposely avoid, although from them, besides *Pfersdorffii* and *Cooperi*, only a very few were used. He dealt with the true species in seeking new forms rather than using the ones handed down. He was the first to cross *Echinopsis* with *Epiphyllum* and was convinced of success, but Karl Schumann took the contrary standpoint, answering with the experience of other breeders. Later German hybridizing was built upon the application of Nicolai's varieties.

Georg Bornemann was the first to follow Nicolai and in 1894 he founded a large horticultural establishment in Blankenburg where he began his hybridizing of the larger blooming *Epiphyllums*. He restricted himself to using only the best hybrids of his time for his crossings. In this endeavor he obtained from Nicolai a complete assortment of his hybrids as well as the best large flowering kinds of the English breeders Veitsch & Sons. Working with the best material then available Bornemann thus united the two best lines—German and English, the latter having already taken the best of the French strains. Thus he produced species of extremely great beauty. All of Bornemann's crosses are marked by thick, dark green, strong branches in clumps without becoming unshapely. A profusion of flowers is characteristic of them. He produced many "German Empress"\* types, and through these, produced shadings in color in the flowers which are indescribable. These varieties are so singular

\* Believed to be a sport of *Nopalxochia phyllanthoides*.

that one readily perceives them to be Bornemann's originations.

The greatest hybridizer of today is Curt Knebel who was born in Erlau, Saxony, in 1871. He inherited his love for the plant world from his father and served his apprenticeship in the nursery of Gustav Albert in Hainich. He was employed at the Widemann Garden Administration, Haage & Schmidt in Erfurt,



FIG. 132. *Victoria Regia* was named by Bornemann. The outer petals are yellow with a dark orange red on the outside. Inner petals are white.



FIG. 133. Schumann showed Erebus as a good example of a brilliant red.

Otto Mann in Eutritzsch, and at the great Royal Garden in Dresden under the direction of Bouche. In 1894 he set up his own nursery in his home city. Knebel devoted himself to the hybridizing of *Epiphyllums* since about 1900. He began with a small number of Nicolai's plants and later with some of the finest varieties of Bornemann and others in Germany, such as Land-

scape Painter Serner, Frau Anna Rettig, Frieda Weingart, and Rother's Seedling; thus he built up plants from those created in Germany. Inasmuch as he took in addition the best kinds of Simon and Courant, he brought to a conclusion all previous endeavors. At the same time Knebel opened the way for future hybridizing of new types such as double flowering varieties and in other cases dwarf kinds. Each improvement in breeding brought improvement as to suitability of Orchid Cacti as house plants. Knebel also hybridized *Echinopsis*, as Nicolai had done

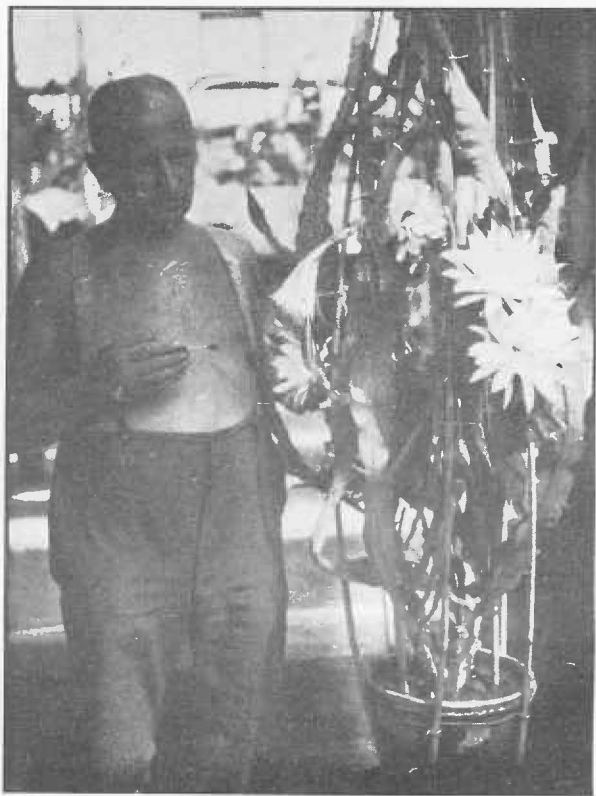


FIG. 134. Curt Knebel brush-pollinating a six-year-old plant.



before him, especially using the yellow flowered *E. aurea*. He had hoped all along to produce a hybrid with yellow flowers, which had never been done. After observing a portion of seedlings he was of the opinion that the crosses were successful but later observations showed him that this was not true.

However, Knebel had for a long time perceived that while large flowers and new colors were advantageously produced, other characters of the plants were not so satisfactory. Through crossing of such distant species as *Selenicereus grandiflorus*, its sensitiveness as well as its fine flower form was inherited in the hybrids, which fact is proven inasmuch as these crosses of the early breeders have not survived. With the clear knowledge that the future of these hybrids as house plants could only be assured if it succeeded in eliminating the unwelcome inheritances, he destroyed the tender varieties regardless of their flowers. His rapid

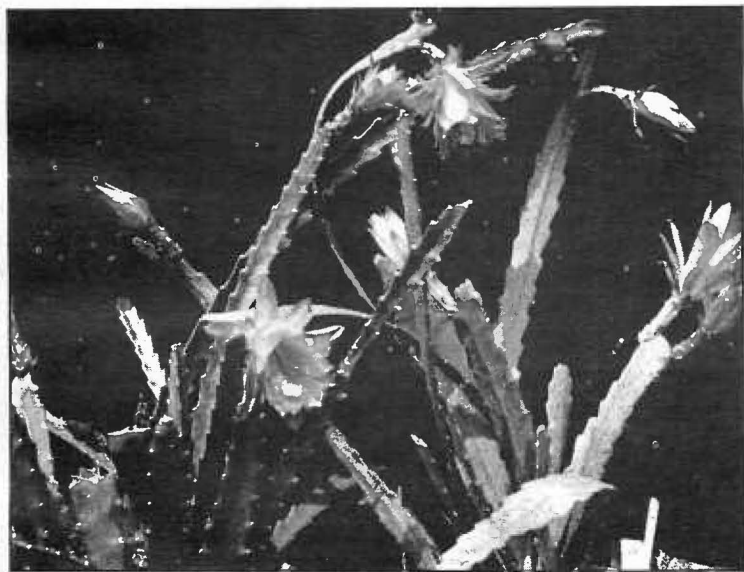


FIG. 135. *Cinnabarinus* and *Ackermannii* hybrid are quite similar—both flowering out of season and over a long period.

cultural method permitted early discovery of these. He kept all plants, seedlings as well, under much lower temperatures than anyone before him had dared, and watered and sprayed with cold water summer and winter, simulating the conditions of their habitats.

Knebel created new types inasmuch as he employed *Helio-cereus cinnabarinus* as the mother plant in crossing with *Epiphyllum* hybrids. He endeavored to produce *Cereus*-like plants which had beautiful flowers without producing greater bulk. By using *H. cinnabarinus*, the blooming season was brought ahead to February or the beginning of March which is about the time the hybrids begin to grow. Then too, plants of this parentage are hardy and require much less care. These crosses which are designated as *H. cinnabarinus* hybr. (Knebel F-1), produced 14 flowers on 3-year-old seedlings which began to open the last of February, each remaining open for approximately two weeks, however, the cool winter rest probably contributed much toward this condition. The growths resemble the *H. speciosus* type, and the flowers are funnelform, in contrast to the less open, more tubular ones of *H. cinnabarinus*.

It is apparent there is no constant yellow color among the hybrids up to the present time. The most effective is found in Knebel's Deutschland. As for the remainder, the yellow color is predominantly in the outer petals.

Besides the hybridizers already named we will only mention the Belgian, de Laet, who dealt in the hybridizing of *Epiphyllums* at times, mainly using French types.

In America the growing and hybridizing of *Epiphyllums* only dates back about twenty years. H. M. Wegener of Los Angeles California, was one of the earliest importers and within ten years built up a collection of several hundred kinds.

Mrs. Clarion Steele of Los Angeles was also one of the leading hybridizers in 1934 and listed more new hybrids than any other grower in the country. Such an enormous listing tends to confuse the collector and it is doubtful if all of the slight variations

are deserving of names. However, among these hybrids are some of the finest types that we are growing today and since the collection and stock has passed to the Beahm Gardens there is assurance that a careful selection will be made and the worthwhile hybrids will be placed on the market as fast as they are tested.

Among the American hybridizers are: Mrs. Gertrude Beahm, R. W. Kado, Coolidge Gardens, Cactus Pete, and Mrs. Theresa Monmonier. All have contributed to the list of better hybrids.



FIG. 136. Bambi is a popular hybrid originated by Theresa M. Monmonier.

The late Dr. R. W. Poindexter of Compton, California was influential in popularizing the growing of *Epiphyllums*. He was in an enviable position to grow, test, and hybridize under ideal conditions, and to record his findings. His scientific training was well applied to this work and many fine hybrids were the result. He was foremost in listing and promoting their distribution

while leading the Epiphyllum Society of America, which was founded in 1940. He encouraged the standardization of names and were it not for his untimely death his leadership and enthusiasm would have influenced the future of this fine group of plants.

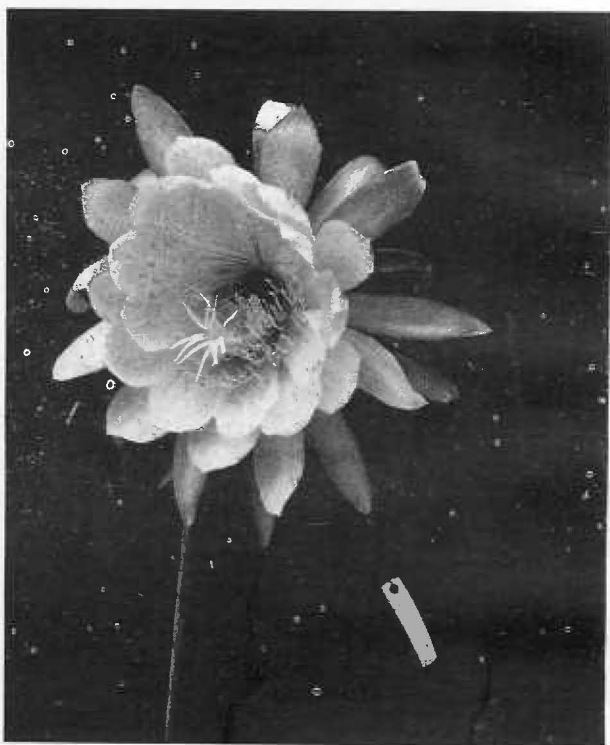


FIG. 137. H. M. Wegener named this My Own and it is considered one of the finest whites.

## HYBRIDIZING

Cuttings produce plants like the parent but if new varieties are to be created, one must resort to seed culture. There is no short cut and for that reason the subject of hybridizing is most important and fascinating in working with Orchid Cacti. Unless the strains are improved by seed culture they will eventually deteriorate and become lost.

Before discussing the technique of hybridizing we will review the natural function of pollinating. In reproducing itself and completing the life cycle of a plant, the fertility of seeds is dependent on this process. Months or sometimes years are spent by a plant in attaining maturity at which time it flowers. This is the most miraculous period of a plant's life, when its very existence may depend on a few grains of pollen.

The subjects of pollination, heredity, and hybridization are contained in many botanical text books but who will take the time to dig out these principles and test their application to the plants we are now discussing? Since we are primarily interested in hybrids, and hybrids are dependent on the exchange of pollen, we may well discuss in detail the basic laws that will tend to clarify our work.



FIG. 138. Since Epiphyllum flowers are bi-sexual any plant can be used to bear seeds (mother plant) or to supply pollen (male plant).

The pollen of one flower is transferred to the stigma of another flower.



FIG. 139. The honey bee leaves some of the pollen on the stigmas and fertilization is complete.

First let us review the parts of a flower that are concerned with reproduction. Whoever undertakes plant breeding must understand the mechanics by which a plant makes known its appeal to insects which would pollinate the flower. Some flowers are self fertile, that is, they utilize their own pollen from the same flower. Other plants have both staminate (male) and pistillate (female) flowers and depend on wind or insects to carry the pollen from one to the other. The Epiphyllums have both pollen

bearing and receptive organs in the same flower but depend upon the exchange of pollen from flowers of a different plant.

Flowers that are self fertile are gradually declining and in a few million years may cease to exist. Those that depend on fertilization by pollen from another flower of the same kind are the ones that produce the variations and are improving by their adjustment to the changing environment. It is this group that has an unwritten alliance with insects, one or more types, to carry out the pollinating.

Bees seem to have the highest priority for performing the function for Epiphyllums. It is never a one-sided deal and for his part in carrying the pollen dust from one flower to another the bee is repaid with nectar, as well as pollen which is also her food. The honey bee has specially constructed pouches on her legs for carrying the pollen back to the hive where it is also used in the making of honey-comb.

We may briefly say that pollenizing is the transferring of pollen from the anthers at the end of the stamens of one flower to the stigma-lobes at the end of the pistil of another flower. Hybridizing means the exchange of pollen from *different* plants, not of the same variety.

A thousand years ago history records that growers of dates along the Nile found it necessary to hang flowers which produced pollen among those which did not, although they did not understand the reason. Linnaeus found that pollen and pistil must unite for production of fertile seeds. At first it was thought that pollen developed into seeds instead of the actual fertilization of the embryo seeds contained in the ovary.

The pollen grains are minute dust-like particles that are produced at the tips of the anthers. They assume different shapes and are an interesting study with the microscope. They are short lived, perhaps only a few hours to a day, yet their forms have been preserved among the fossils millions of years ago. This pollen is produced in abundance in hopes that a sufficient amount may reach its destination. A chamber about the size of

the head of a pin, within the anther, disperses these globular pollen grains. The parts of a flower producing the pollen may be termed the male organs.

The female, or receptive organs, are the five to fifteen spreading, finger-like receptacles, called "stigma-lobes," at the end of the pistil. When a pollen grain is placed on the stigma it immediately sprouts, so to speak, and sends a thread-like filament of protoplasm down through the style. When the nucleus of the pollen grain makes contact with the nucleus of an ovule (single, partially developed seed) fertilization has taken place and the seed will ripen and be productive. Thus is seen the necessity of utilizing a sufficient number of the abundant pollen grains so that each ovule may have this required pollen grain for fertilization, otherwise only a few of the seeds in the ovary (or fruit) will ripen.

At the base of the flower is the ovary containing partially developed seeds called ovules. Each ovule must be fertilized by a pollen grain by some means outside itself. In other words, to complete the life cycle of a plant, contact must be made between an ovule and a pollen grain.

To safeguard against self pollination the stamens are usually shorter than the pistil to avoid their own pollen from falling on the stigmas. In plants having stamens and pistil the same length, the pollen usually ripens before the stigma-lobes are receptive.

Nectar, or a honey-like substance, is secreted from the base of the petals where the stamens are attached. There are no specialized nectar glands on *Epiphyllum* flowers as in some others. The secretion occurs at a time when the flower is ready to receive the pollen and at times the nectar actually drips from a flower. The nectar attracts the insects down into the flower so that the pollen dust carried on her body may become deposited on the stigma-lobes.

The size and color of the hybrid flowers attract the bees during the day while the fragrance and whiteness of the night-flowering species attract the moths at night. The latter have feathery antennae that wave in the air to catch the odor of flowers, and



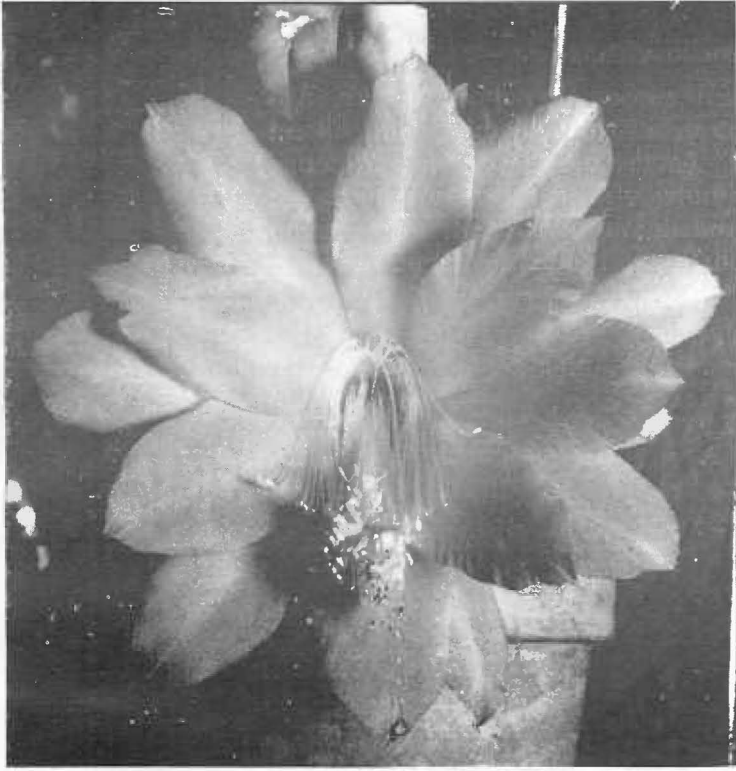


FIG. 140. Nectar is secreted into the throat of the flower and actually drips in the early morning.

whereas color discrimination is limited to a few feet, odor travels considerable distance. The fragrance is usually emitted in the evening or early morning; the flower often being odorless during the day. Sometimes the odor is musky or unpleasant, yet it is effective in attracting some types of insects. Thus the flower may attract an insect by its fragrance and in exchange for the pollen which the bee unconsciously deposits, it receives a reward in nectar.

Hand pollination is controlled pollination—to distinguish it

from the haphazard method of the bees. Too many hybrids result from a little pollen from this and that in a hit or miss manner without plan or record. This is not real hybridizing even though fool's luck may occasionally produce an acceptable variation.

In hand pollination use the finger tip, a clean brush, or a toothpick, the latter preferred because it can be thrown away after pollinating, whereas a brush must be cleaned in alcohol so as not to mix the pollen. After a flower has been pollinated it should be "sacked" or covered with a small glassine or paper bag fitted snugly around the base of the flower so that insects cannot bring in "foreign" or unwanted pollen. Use extra care by segregation so that the flower is not submitted to pollination prematurely.

Cover the stigma-lobes thickly with pollen so as to insure a full crop of seeds. Be sure that the grains have not been damaged by water; many flowers are so constructed to keep the pollen dry but this is not true with *Epiphyllums* with their long cascad-



FIG. 141. Fully expanded flower with spreading stigma lobes awaiting the application of pollen.

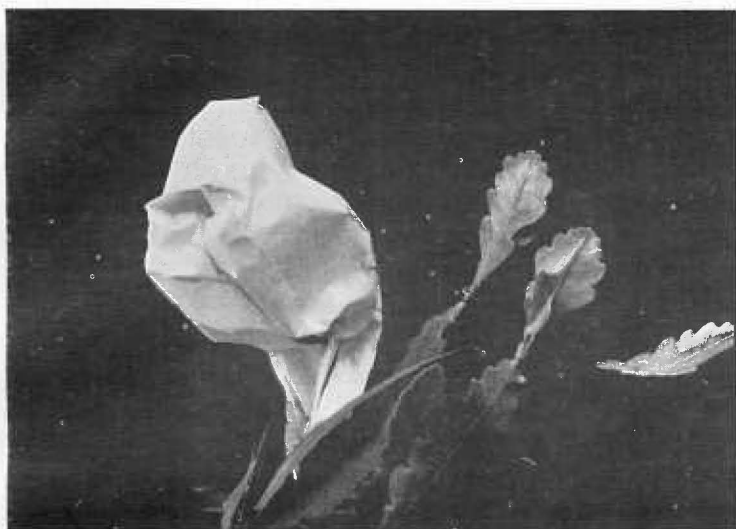


FIG. 142. To prevent mixing the pollen, flowers are often bagged.

ing stamens. After the flower has withered, the sack may be removed. Be sure each fruit is tagged so that your records will not be lost.

Nature seems to have proven that pollination between flowers on different plants of the same kind, or closely related varieties, is preferable for greater vitality than self fertile flowers. The intricate adjustment between flower and insect bears out this conclusion. Watch a plant flower and unless conditions are favorable for pollination most of the spent flowers will drop off without setting fruit. If they were self fertile this would not be the case. One may believe a hybrid is self fertile if a single flower sets fruit, but later observation will show the failure of the fruit to mature, or the seeds will be sterile.

Certain varieties are more difficult than others to hybridize; some are sterile in their ability to produce fruit. The true species *E. strictum* is an example of a difficult plant on which to obtain fruit in cultivation.

The purpose of hybridizing is to improve a plant or flower or to originate new varieties. In nature, hybridizing is constantly taking place, unnoticeable perhaps, but the host of intergrading species leads to this conclusion. The exchanging or "crossing" of the pollen of two distinct varieties is called hybridizing and the resulting plants are known as hybrids. Nature has established conditions so that dissimilar plants (as well as animals) will not cross, otherwise there would be no distinction among the various groups.

#### LAW OF HEREDITY

The hybrid *Epiphyllums* with which we are concerned were developed by crossing the white-flowered true species with related cacti. To understand how certain results were obtained we must first know the laws of heredity, upon which all plant breeding depends.

Characteristics are transmitted through successive generations and marked resemblances existing between parents and offspring are not accidental. Within the minute cells of which a plant is made, there exist invisible hereditary elements termed "genes" which are borne in the chromosomes. These genes carry every potentiality of the entire plant down to the shape of the branch, spination, flower shape, color, etc., which determines its likeness in the next generation. As the cells divide in plant growth, the chromosomes, which are always constant in number for each different species of plant or animal, divide in such a way that each new cell has the same original number. This is accomplished by their splitting longitudinally, along with the genes, and then forming two complete sets which make the nuclei of the two new cells.

Thus a grain of pollen carries the entire hereditary contribution to its offspring. When sexual reproduction occurs the pairing of cells becomes one, and both parents are equally potent in transmitting hereditary characters. An individual inherits some of the characters from each parent but neither parent can transmit all of its characters to any one of its offspring.

The result is that there is variability among offspring of the same parents. Before discussing Mendel's Law, which is generally accepted today, we must recognize the conditions that make this law difficult to apply unless working with true species instead of hybrids. Most of our hybrids have been developed by a series of intercrossing which has taken them a long way from the original first cross. Fortunately *Epiphyllum* growers have the advantage over growers depending on seeds, in that these plants may be propagated from cuttings which gives assurance that plants grown from the cuttings will be like the parent. The seed plants which must depend on pollination each year are apt to vary.

George Mendel, an Austrian monk, published his discoveries in the middle of the eighteenth century. In crossing plants having different characters he found that the inheritance of characters were in a definite mathematical ratio. He found that the determining factor in heredity depended on sets of characters: large or small, tall or short, robust or weak, white or red, etc. When two plants are crossed having the same character the results are a strengthening of that quality, but when two contrasting qualities are united, one or the other is always dominant. In other words the element responsible for carrying the hereditary factor accepts one or the other of each contrasting quality.

Thus if a white-flowered *Epiphyllum* is crossed with the red-flowered *Heliocereus* the plants raised from the seeds resulting from the cross may all be red or pink in the first generation. This shows that the red is "dominant" and the white is "recessive." The same results would have been produced regardless of which species was used as the seed parent.

If this first generation is allowed to pollinate itself the resulting seeds will produce three kinds of flowers in the ratio of 1:2:1. This means about 25% of the second generation plants will have red flowers, 50% pink or light red, and 25% white. However, in this case, there would be variations in these colors since the flowers of *Heliocereus* are not a pure red, but have

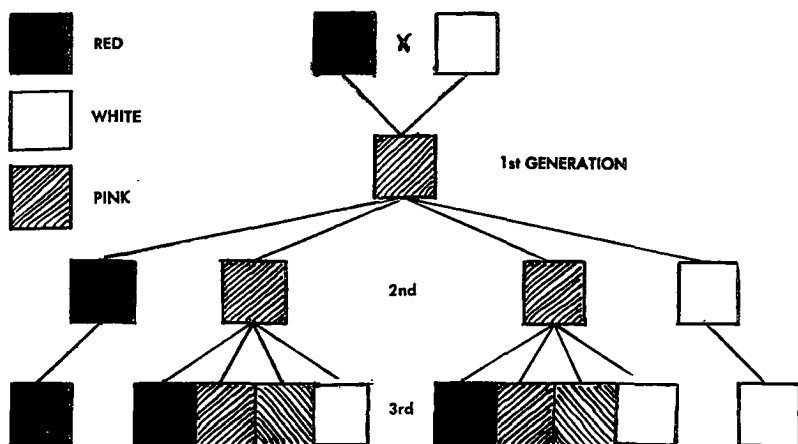


FIG. 143. Mendel's theory of heredity applied to the crossing of a red flower with a white and then back crossing each with itself. The character of the hybrid does not become fixed until after the second generation.

magenta or purplish markings; the white and red would dominate. Thus may be seen why any of the flower colors of hybrids is not "set" until the second generation.

The red flowers derived from this cross will breed true when pollinated with red flowers from the same generation, likewise the whites when pollinated with white flowers. The other half will continue to produce further hybrids in the same ratio of 1 red, 2 pink or light red, 1 white. Thus we see that with each successive crossing of the mixed colors, the percentage like the parents decreases with each generation.

Galton's Law simply states that heredity traits are so intermingled that we may assume, as a general rule, that offspring of a given generation will inherit about half their tangible traits from their parents, one-quarter from their grandparents, one-eighth from their great grandparents, and so in a decreasing scale from each earlier generation. This explains why a red-headed child may be born to parents both having black hair; in a remote generation there was red hair in the family.

In other words we may expect half of the traits of the parents in the offspring but the other half will be inherited from remoter generations. According to this theory we may be reasonably sure as to the results of half of the characters of a cross but the other half is more or less unpredictable.

From these laws one can work toward definite results and expect a percentage that will have the characters desired. By selecting from each generation only those with sound possibilities and destroying the inferior kinds, real improvements can thus be made. If hybrids are used for further crossing, results may be less distinct because they are "heterozygous" or made up of various strains with many additional inherited characters that may show up in any generation. Certain characters, submerged in the first generation hybrids, may reappear in the second or future generations.

Except in a few instances, the hybridizing of *Epiphyllums* in America has been haphazard, resulting in a few desirable kinds but with no knowledge of their parentage. Were some grower to start with the true species and by careful records and proper selection, a race of fine flowered types could be produced which would rival any of those in Europe, and be improvements over the kinds now being grown.

In fact we might have "pedigreed" plants which could be recorded with the *Epiphyllum* Society, in a "proving ground," or by a botanical garden. By careful breeding and selection, distinct types with longer flowering periods, disease resisting, basket forms, flowers of unusual and constant colors, corsage and cut flower types, and extremes in large or small flowered kinds, can be produced.

It is definitely known that some hybrids are good breeders while others result in weak offspring. Others are affected by environment and the law of variation. We have seen how soil, water, fertilizer and exposure affect the color of flowers, from season to season; even cuttings from the same plant may produce a variation in flower color and size when grown under different

conditions. Like people, there are no two plants or flowers exactly alike. It is this law of variation that makes a plant able to adapt itself to changing conditions. Only improved types survive, the inferior kinds die out.

All varieties will deteriorate after being grown a long time unless there is an introduction of new blood, or a definite plan of selection. Hybridizing can be retrogressive by using inferior stock. Crosses between distantly related plants such as *Echinopsis* have not been known to make lasting hybrids, and there is a tendency toward sterility (producing infertile seed). Crosses with *Selenicereus* tend to produce plants having short lived flowers. Blending of racial strains is needed as a stimulus to produce strong plants. For example, if *Heliocereus speciosus* is crossed with a true species of *Epiphyllum*, and the ensuing hybrid is again crossed with the strain produced by another grower, a vigorous plant should be the result. Too much of our stock is from one plant which has been distributed throughout the country with no new blood being injected into it. For better hybrids we must introduce more basic crosses so that a strain does not degenerate.

It is important to "fix" the characters desired, that is to apply selection, segregation, and recombination for two or three generations. By "inbreeding" or line breeding, wherein the first generation is bred to the second one, either the resulting generation will be especially good or very bad. If selection is carefully carried out, a strain may be "purified" as the defects are weeded out in each generation.

Occasionally a "sport" may appear which will be distinctly different from the parent. It may be the entire plant, a branch, or a single flower. A color sport that persists two seasons may then become "fixed" or permanent, although usually a sport is temporary and soon reverts to the normal characters from which it deviated. Dormant characters are sometimes awakened by unusual conditions, which may be produced by soil or weather or artificially by acids or X-ray. Sports sooner or later produce



a flower called a "throw back" which is like the original and thus divulges its parentage. For example, the variegated Mon Cherie is a sport of Amber Queen and occasionally both variegated and normal flowers appear on the same plant.

Richard Diener discovered that, by using the pollen from a flower (male) half the size of the one (female) receiving the pollen, 12% of the offspring will have flowers which are half the size of the male parent. This might be a suggestion to those who are working for small flowering hybrids. The Kaiserin used as a pollen parent with a larger flowering hybrid should result in plants with small colorful flowers. Seeds from the second generation of these crossed with themselves should produce flowers that are somewhat "fixed" and thereafter would come as true as the law of variation allows.

In a similar manner Mr. Diener found that the size of the flower could be enlarged by using pollen from flowers the same size of those receiving the pollen. Ten to fifteen percent of the seedlings will have extra large flowers while the balance will be divided between those of the parent size and variations between the two extremes. In further interbreeding with selected hybrids the desired qualities will be proportionately larger than in the first cross. He found that the pollen bearing parent is usually the dominating factor for color (except white which is usually recessive). Consequently the pollen of the flower of the most desirable size or color should be chosen in the crossing. For light shades use the pollen from white or light colored flowers.

Plants selected from the second generation are generally used as the seed bearing (female) plant, to which is added the pollen from the same plant from which the original cross was made (unless line breeding is desired).

#### APPLICATION OF HYBRIDIZING AND HEREDITY

In nature only related plants will cross or hybridize. For instance an *Aloe* cannot be crossed with an *Epiphyllum*, but an *Epiphyllum* may be crossed with a related cactus. The cactus

family has been subdivided into many genera and those that easily cross with *Epiphyllums* are closer in relationship than those that cross with difficulty. A common example used to show the relationship between animals may state this more clearly. Dogs and cats are not related, but dogs and wolves are; therefore dogs will cross with wolves but not with cats.

Early hybridizers found that color could be added to the flowers of true *Epiphyllums* by crossing with a species of another genus of cacti, such as *Heliocereus*. Nicolai Bornemann and the Frenchman, Courant found that by crossing with *Heliocereus schrankii* the resulting hybrids produced flowers four weeks earlier than other hybrids, thereby lengthening the flowering season. It was also found that the *Heliocereus* influence as a ground plant made the hybrids more adaptable for pot culture.

If the pollen of *Heliocereus* (male) is transferred to a true *Epiphyllum* (female), the offspring will have flowers different from those of the mother-parent because white is recessive and the branches will be winged. If the pollen of a green-branched, red-flowering Orchid Cactus is transferred to the purple and red-flowering *H. speciosus* hybrid, seedlings of this cross will often have three-angled branches with a pike-blue coating, bristles in their areoles, and flowers that are red with a purplish cast.

If the pollen of *Selenicereus grandiflorus* is transferred to *E. crenatum*, the ensuing forms will have branches and also flowers similar to the latter but will possess an entirely different habit of growth. The epidermis will be different, the ovary will possess white spines, the rounded portion of the stem will produce the flowers. It will be recognizable as an *E. crenatum* strain but of entirely different form. Thus the hybrids Cooperi, Pfersdorfii and others originated. If the pollen of *E. crenatum* is transferred to the small-leaved mass-flowering *Nopalxochia phyllanthoides*, a strain with dark-green, thick, short branches with wool in the areoles will result; it will also be a mass-bloomer. The flowers will probably be larger, but in other respects similar to those of the mother plant. This cross consists of having been made from

two true species, and is therefore a very successful one, the same as the previous crosses.

With the crossing of two hybrids the greatest surprises result. For example: the hybrid *E. crenatum* x Haageanus is crossed with Cooperi, both of which have beautiful bright colored flowers that are cupped and of a deep dark purple color are produced, although Cooperi and Haageanus both possess an open flower form in white and flesh-color. The branches will partly resemble Cooperi and partly *E. crenatum*.

Many hybrids can only be generically propagated with difficulty or not at all. But when it is possible, wonderful colors are produced that excite the breeder to new sensations. Thus the veined, variegated, many-colored flowers originated.

Interesting crosses are produced from *Echinopsis* and *Epiphyllum*, since the former, like *Cereus* is related to *Epiphyllum* Nicolai, for instance, conceived the following new idea: The pollen of *Echinopsis* upon *Epiphyllum* resulted in white, large *Epiphyllum* flowers. Branches were angled, blunt, gray-green, short and thick, flowering freely when quite young plants. Areoles produced wool in more or less abundancy. The structure of the branches was thoroughly different from other species. This cross was intended to be an early bloomer.

Without seeing the flowers it is hardly possible to name present-day hybrids. However, the following characters in plant growth may somewhat indicate their parentage:

1. Grass-green branches, some three-angled, some flat with a tinge of bluish bloom and bristles in the areoles; flowers day-blooming with short tubes, red, and red tinged with purple. Descendants of *E. ackermannii* and *Heliocereus speciosus*.
2. Branches gray-green to grass-green, long-stemmed, completely flattened; thick, sharp crenations, with hardly visible areoles; new growth deep, dark red and glossy. Descendants of *E. crenatum* and *Selenicereus grandiflorus*.
3. Branches thick, shorter, nearly dark green, having wool in the areoles, strongly crenate. These are a mixture of *Nopalxochia*



FIG. 144. Wrayi has a white flower with some yellow in the outer petals. It is obviously a cross between *E. crenatum* and *Selenicereus grandiflorus*.

*phyllanthoides* with *E. crenatum* or with *H. speciosus*; also *N. phyllanthoides* x *E. ackermannii*.

Thus some of the hybrids can be recognized to some degree, without flowers. This signification will enable one to learn the right culture for them since each variety does not require the same treatment.

A summary of the different strains and varieties according to European observations follows:

1. *E. crenatum* x *S. grandiflorus* form the Cooperi class. Many varieties of this class have white, cream, yellowish flowers possessing long tubes. The ovary bears white bristles and the long tube has narrow scales. The narrow outer petals are either yellow or purple-red, or bronze-colored. The petals are broad with soft tips and are arranged in open form. The flowers remain open

three days and have a diameter of 7 in. At night they are extremely fragrant, in the day not at all. The form of the plant is vigorous, compact. The branches are of medium length and thick; the weak crenations are sharp-edged, and the areoles small, with occasional bristles. Should be kept in a winter temperature of about 50° F. Often the long and cylindrical branches have the peculiarity of producing more flowers than the flat ones. All varieties of this class are true show-plants. Here belong: Cooperi, with yellowish white flowers; Pfersdorfii, outer petals yellow, inner petals white; Tettau, cream-colored.

2. Besides the Cooperi class, there exist excellent hybrids of *E. crenatum*. These have symmetrically formed crenations, thick leaves, longer branch stems, and small scales in the areoles. To this group belong Haageanus, with its flesh-colored rose, large, beautifully shaped flowers. This type is recognizable by the regular crenations, scales at the areoles, and dark grass-green color. These hybrids love warmth, half-shade and moderate moisture. In winter 50° F. suits them well.

3. *Epiphyllum crenatum* x *Nopaloxchia phyllanthoides*. This is a large class with broad, dark green, short, thick, deeply crenated, plentiful branches. The flowers are rose often with carmine dots and have a closed form. Crenatus Amarantinus\* is a representative of this class with small areoles having short wool; the branch is glossy. The plant blooms three times yearly. Crenatus Vogelii has flowers with narrower petals than Amarantinus.

4. *Nopaloxchia phyllanthoides* x *E. ackermannii*. From this cross arose the variety Capelleanus which is a true show plant. In plant body it is similar to *E. crenatum* and *N. phyllanthoides* but the flowers are more full than those of their parents. The color is dark rose with a red sheen. The flower form is compact, full and nearly spherical. It is one of the finest hybrids of *N. phyllanthoides* we have, since it is a mass bloomer, and because the plants are hardy and require only a temperature of 45° F. in

\* Many of the early European hybrids were given Latinized names.

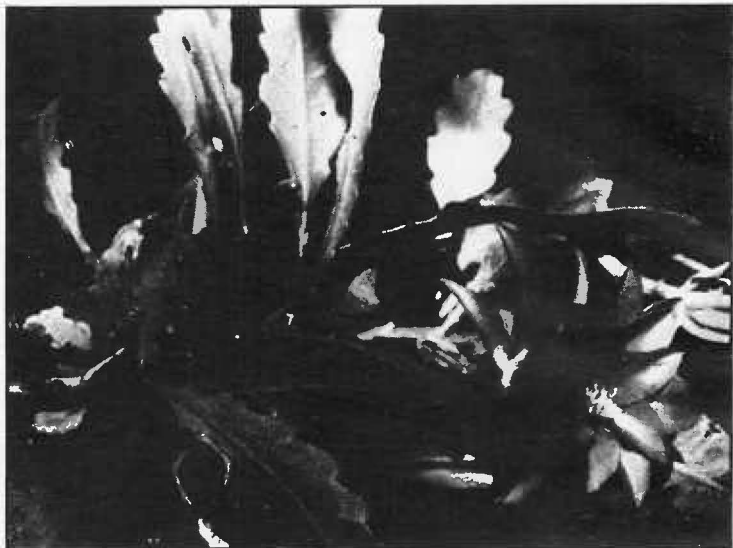


FIG. 145. June Kelly is one of Theresa Monmonier's new hybrids of the small *Ackermannii* type.

winter. In summer a sunny location and good moisture are desirable.

5. *Epiphyllum ackermannii* x *Heliocereus speciosus*. The descendants of these two species are the most vigorous plants among the hybrids. The branches are extremely strong, short, with distinct crenations, often with red edges, and new growth which is red. Distinguishing characters of this class are bristles at the areoles, short, broad branches often three-angled, sometimes covered with a blue coating (bloom) and of blunt form. The flowers have a short tube with many scales. The color is scarlet or purple-red, both colors often being suffused with a bluish-purple tint, this color forming a border on the petal edges; the center stripe is a dominant scarlet-red. All varieties are day-blooming, remaining open from four to five days. They bloom well with an abundance of flowers. Often we find two-colored

stamens, and a carmine style. The flowers are approximately 6 in. in diameter. A location in winter of 40° F. suits them well, and they should be kept nearly dry; sunny and well-watered in the summer. This class often blooms twice a year, in the spring and again in early fall. Among the first and best hybrids in this class is Jacques Courant with branches bluish, tinted with reddish new growth. The flower is blue\* with three-cornered red scales at the base of the petals. It makes quick growth. Franzii has purplish petals with scarlet-red center and narrow, sharp, crenate branches (from *H. speciosus*), with strong bristles at the areoles. Kampmannii has large purple-crimson flowers.

Since many varieties are like *H. speciosus* or *E. ackermannii* in color, they are very similar in spite of different names.

According to observations in Europe, hybrids with cushioned areoles have rose flowers; those with bristles in the areoles have red and purplish flowers; those with scales at the areoles usually have yellowish white or orange-colored flowers. Hybrids with scale-bearing areoles are more sensitive than those with hairy areoles and should be watered with greater care during the winter. Plants grown from seed were found to be stronger than those grown from cuttings; this may be the reason why some of our plants, which have been propagated and re-propagated from cuttings, are weak and are so susceptible to disease.

Early European growers preferred the Cooperi class hybrids. Here is one example of their methods: Cooperi is selected as the mother plant and Hitchensis as the male plant. The latter is a beautiful, flesh-colored variety, good in both flowers and growth. Pollinate Cooperi with Hitchensis and the result will be a descendant with thick, crenated, tall branches with the growth of Cooperi. As a three-year-old seedling, it produces flowers of a brick red color, but a soft texture, in form like Hitchensis. The fragrance, rare in colored flowers, is like Cooperi. It blooms two to three times a year, often with 20 to 25 flowers. Only choose the best, strongest, and healthiest two varieties, using the strong-

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\* Blue is a misleading term but is used to indicate a color difficult to describe. It is actually bluish purple rather than pure blue.

est as the mother plant. If the cross is reversed, *Hitchensis* x *Cooperi*, satisfactory results would not be obtained because *Hitchensis* does not possess the strength of *Cooperi* and the descendants would likewise be weak.

#### SPECIES OF CACTI USED IN HYBRIDS

Species of the following genera have been recorded as having been used in crossing with *Epiphyllums*: *Heliocereus*, *Nyctocereus*, *Hylocereus*, *Selenicereus*, and *Echinopsis*. In addition, the plant now called *Aporocactus martianus* may have been used in some of the early crosses; it is closely related to *Hylocereus* and was included in Berger's section *Hylocerei* and Britton and Rose's Sub-genus *Hylocereanae*.

In crosses between *Epiphyllums* and any of the above mentioned cacti, the plant form of *Epiphyllum* seems to dominate with but one exception—*Heliocereus* (sun *Cereus*). The latter imparted its 3 or 4-angled branches and spiny areoles and day-flowering habit to many of the Orchid Cacti. *Heliocereus* grows

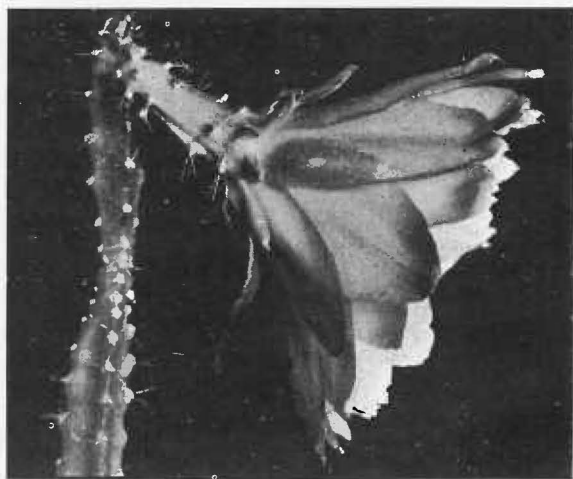


FIG. 146. *Heliocereus speciosus* imparts the short tube and red colorations to hybrids.



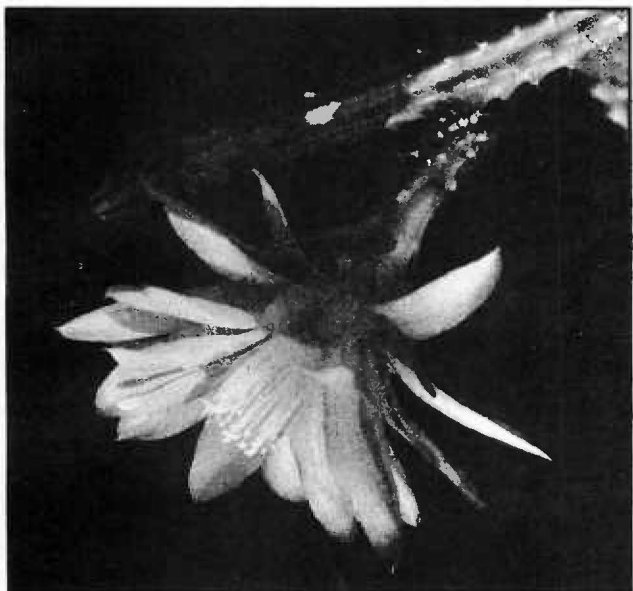


FIG. 147. *Aporocactus* at first glance resembles *Heliocereus* and should hybridize with *Epiphyllum*.

as a terrestrial cactus in Mexico and Central America. Of the six species, those having brilliant red flowers were first used by hybridists in the early 1800's to infuse this day bloomer into the huge night flowers of *Selenicereus*. The earliest cross was called *Speciosissimus grandiflorus*. The resulting hybrids were then crossed with the white, true species of *Epiphyllum*.

The so-called iridescent blue of many *Epiphyllum* hybrids is also due to *Heliocereus*; *Peacockii* (Rumpler) and *Jenkinsonii* (Pfeiffer) are two outstanding examples. The three-angled branches and short tube are carried over to many of the hybrids. *Heliocereus cinnabarinus*, from a 10,000 foot high volcano in Guatemala, has also contributed its influence of hardiness.

The species *Nopalxochia phyllanthoides* was one of the early species to be crossed with *Heliocereus*. Some that are still known

are *Ignescens* (Pfeiffer), and *Superbus* (Walpers).

*Selenicereus* is a genus of about twenty species of clambering or epiphytic, vine-like plants widely distributed in eastern Mexico, Central America, the West Indies, and along the northern coast of South America and possibly extending into Argentina. All have aerial roots on the ribbed or rounded, slender branches. The areoles are small, usually bearing spines. The flowers are very large and open in the evening and last until the next day; scales on ovary and flower-tube are small, usually with hairs or bristles in their axils. The flower tube is long and somewhat curved. The style is long and thick. The fruit is covered with clusters of deciduous spines, bristles and hairs but no scales.

*Selenicereus grandiflorus* is one of the best known parents of

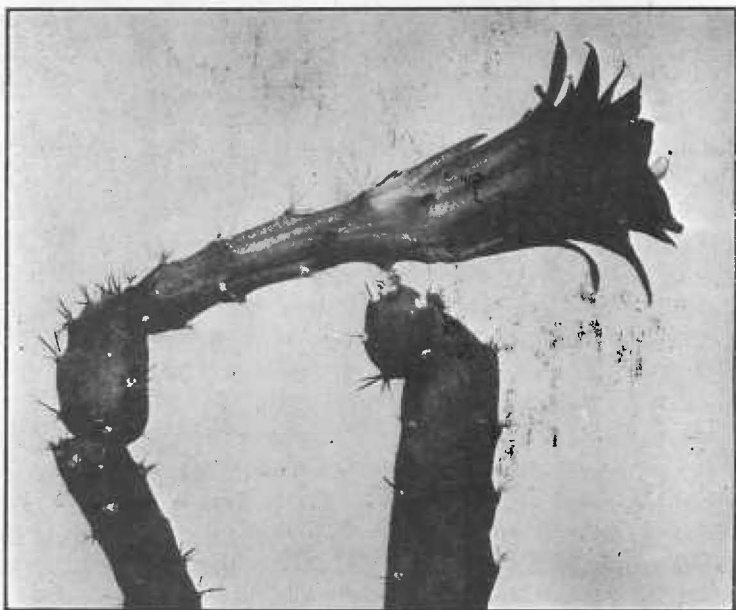


FIG. 148. *Heliocereus cinnabarinus* shows its relationship to the plant we call *Ackermannii* hybrid.

Epiphyllum hybrids. Cooperi is a cross between this and *E. crenatum* producing yellowish flowers.

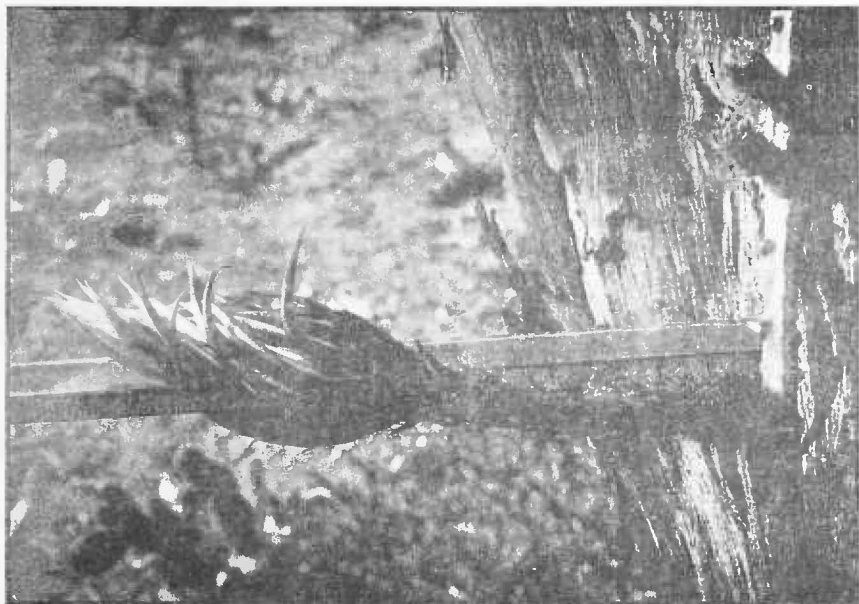


FIG. 149. *Selenicereus* imparted to the hybrids, many petals, long tube with hairs in the axils of the scales.

*Selenicereus* means "moon *Cereus*" and as the name indicates it is night flowering. Its value as a parent with *Epiphyllum* is for its large flowers with many petals. The hybrids from this parentage can be distinguished from those of *Hylocereus* through the absence of the long scales so prominent in the latter.

*Hylocereus* is an epiphytic climbing cactus with three-winged stems having aerial roots. The areoles bear tufts of felt and several short spines. Most of the flowers are white, opening at night and are very large, funnel-form. The ovary and long tube bear large scales but no spines, felt, or hairs; the scales merge with the outer petals and are a character seen in the *Epiphyllum* hybrids.

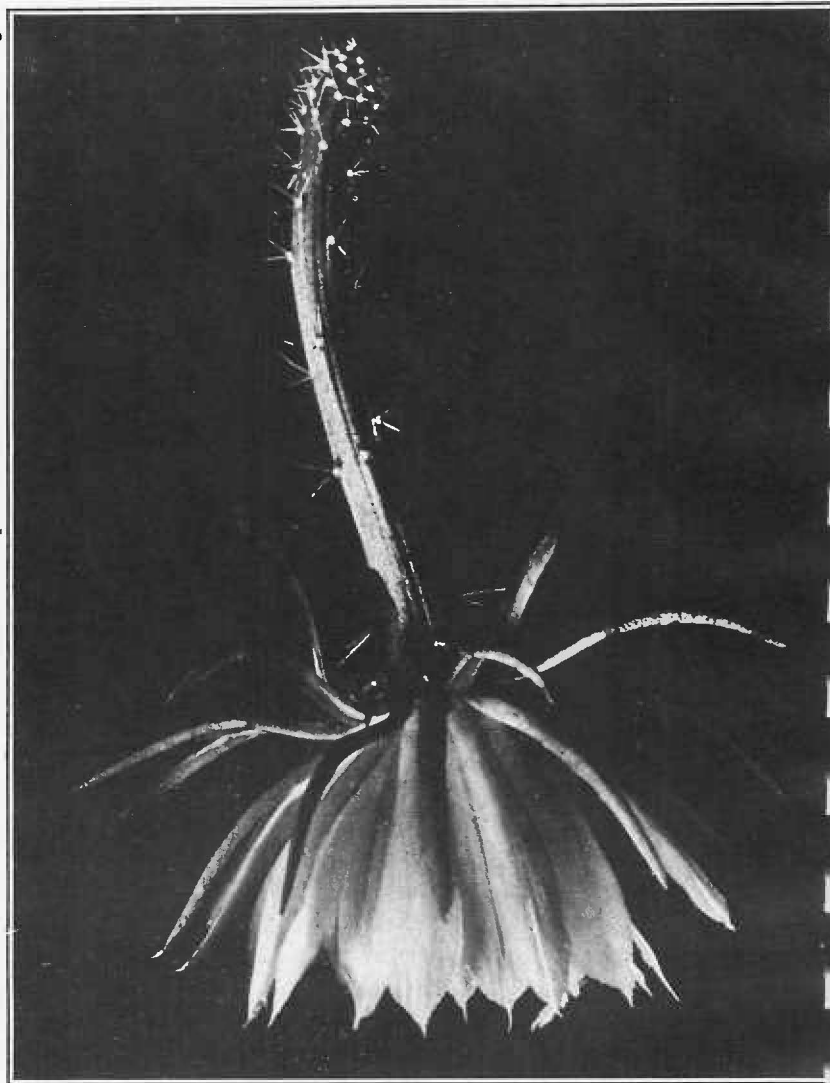


FIG. 150. *Selenicereus vagans* shows its influence by the spines on the tube and ovary, and the long ridges along the tube.

The fruit is spineless and retains prominent scales, which are inherited on the fruit of the hybrids.

*Echinopsis* is so different in plant form it is not surprising that crosses with it as either male or female parent seem to be recessive to *Epiphyllum*. We have yet to see an *Echinopsis* plant form with an *Epiphyllum* flower or an *Epiphyllum* with the straight, formal tube of an *Echinopsis*. American breeders will someday verify the value of this plant in hybridizing. A quality that might improve the *Epiphyllum* strain would be its hardiness.

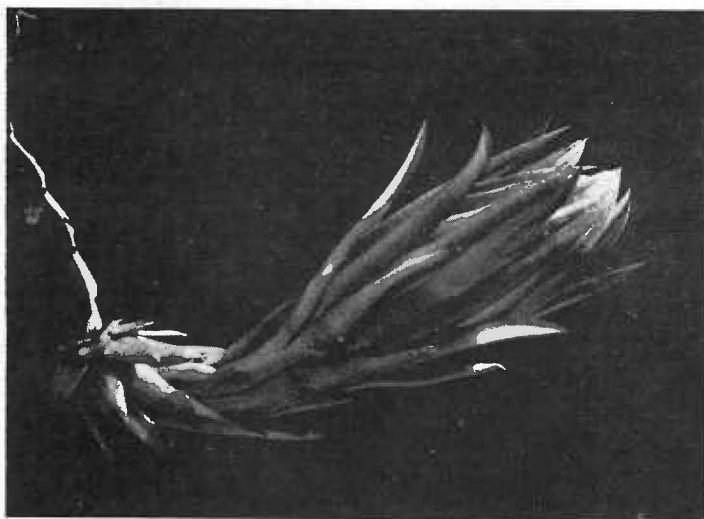


FIG. 151. The long scales on *Hylocereus undatus* are easily recognized on the hybrids where they merge with the outer petals.

No doubt there has been other blood mixed in such a large number of hit and miss crosses. The only natural reason for variation and cross pollination is to better adapt the plant to its environment. The weak crosses die out and the strong survive. Now and then a sport or an outstanding variation occurs so superior to its parents that it eventually replaces them. There is no ad-

vantage in growing an inferior plant except in a few cases for historical record.

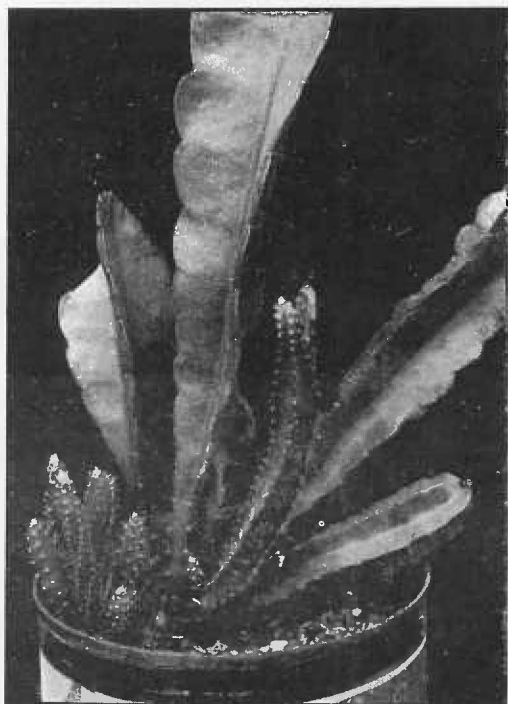


FIG. 152. The vine-like growth of *Selenicereus* is slightly pronounced when it is used as a seed plant.

## ORCHID CACTI

The ease with which the true species of *Epiphyllums* have been crossed with related cacti has resulted in thousands of named hybrids during the last hundred years. The first hybrids were developed in Europe, far from the native homes of these plants. The early maritime traders brought these strange plants from new world ports to their plant minded friends who applied the new art of hybridizing which was then popular.

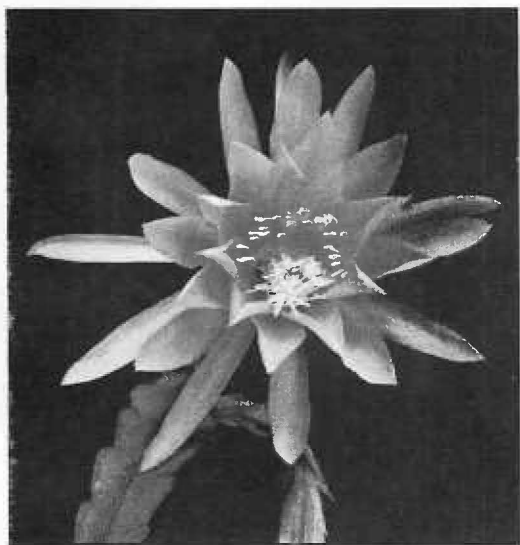


FIG. 153. Frau Hanna Lohse is one of Knebel's (No. 97) hybrids with pointed inner petals.

Although the parentage of some of the European hybrids was recorded and the names handed down, all that remains of most of this early work are the names themselves which can never be associated with any particular plant. Dealers listed several hundred named hybrids in the early 80's, and A. Blanc of Philadelphia catalogued several kinds. Since 1920, importations to this coun-

try have become more numerous, and are distinct types. Some collectors and growers have unknowingly applied names of their own coinage to them. Some of the confusion is due to the importation of numbered hybrids without names; these are distributed under a new name and the old number lost.

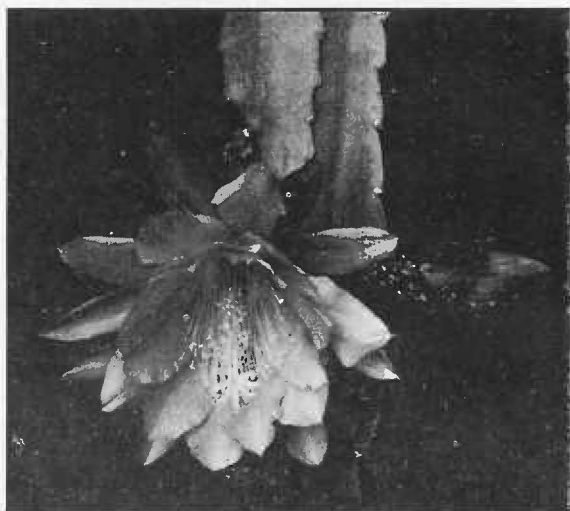


FIG. 154. Pink Nymph is an outstanding small pink basket type. Photographed in the Beahm Gardens.

There is little wonder that hybridizers in various parts of the country or in far away Europe have developed hybrids with quite similar flowers to which have been given different names. These coincidental situations cannot be avoided but there is no excuse for hasty or careless naming of flowers when the source is not known. Still greater is the damage to the trade by the unscrupulous who give a well-known flower a new name merely to enhance its sales value.

The Gladiolus, Iris, and Rose Societies have solved this difficult situation by establishing a "Test Garden" or "Proving Ground" where plants are grown and compared before they are named.



It is hoped that some botanical garden may likewise have facilities for growing a collection of standard *Epiphyllum* hybrids and where the new types may be grown before naming.

The *Epiphyllum* Society of America has already reviewed many of the more popular hybrids and has endorsed certain names as "standard." This work will continue until all names have been

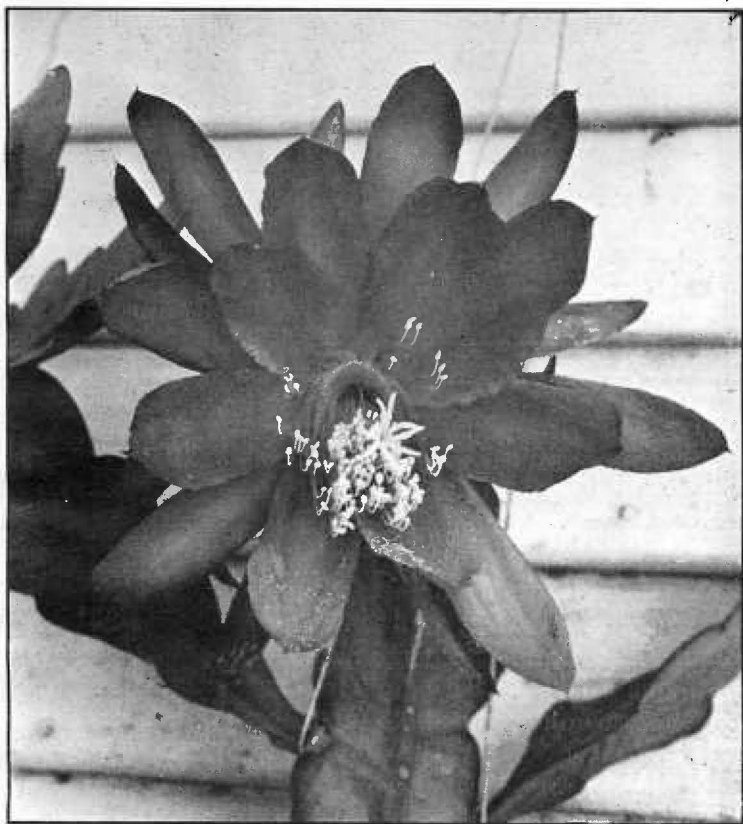


FIG. 155. The red Conway's Giant is one of our oldest imported hybrids. Its origin is uncertain but is thought to contain *Heliocereus speciosus* blood. In recent years the plant is often confused with *Hermosus*. (not *Hermosissimus*).

reviewed. A reference library of Kodachrome slides will accompany complete descriptions so that there will be no occasion for similar flowers having different names if this service is used. The Society requires that a plant be flowered for several years before it merits consideration. One requirement the new name must meet is that it must not be that of a color (as "Henna") and there must be definable points distinguishing it from similar varieties.

Even though we owe many of our fine hybrids to European breeders the excellence of the American hybrids speak for themselves. Our growers are determined not to flood the market with names but to establish healthy plants with distinct flowers that are easily recognizable by the grower and collector alike. Already the weeding out process is under way and dealers are eliminating types which show too close a relationship to others. There is no law to prevent a dealer or a buyer from growing unnamed varieties, but these should then not be casually named until they are carefully checked.

Like the American Gladiolus Registry, the Epiphyllum Society intends to have its own Registry which, after acceptance, places the stamp of approval on a new variety. This adds value for the dealer and protection to the buyer. To be accepted for registry a hybrid should have the following requirements; be healthy and easily grown; free flowering or early or late blooming; have outstanding color, form, or size of flower; lasting quality of flower; pleasing name; availability. Of course judging schedules would include additional qualities.

The selection of a name is important. Cactus Pete cites the old "Magenta" as a very popular plant until its name was changed to Scheherazade; the flower was as beautiful as ever but its appeal was lost. A long and peculiar name creates a certain antagonism—a rose by any other name is *not* as sweet. The public likes a name they can pronounce instead of names like Frau Johanna Atenhofer. Very few object to German names or desire to have them changed any more than they would change the name of a

Beethoven composition. The contrast between the name and the flower such as Adolph Hitler and the beautiful hybrid bearing his name does not detract from its popularity. Catchy or humor-

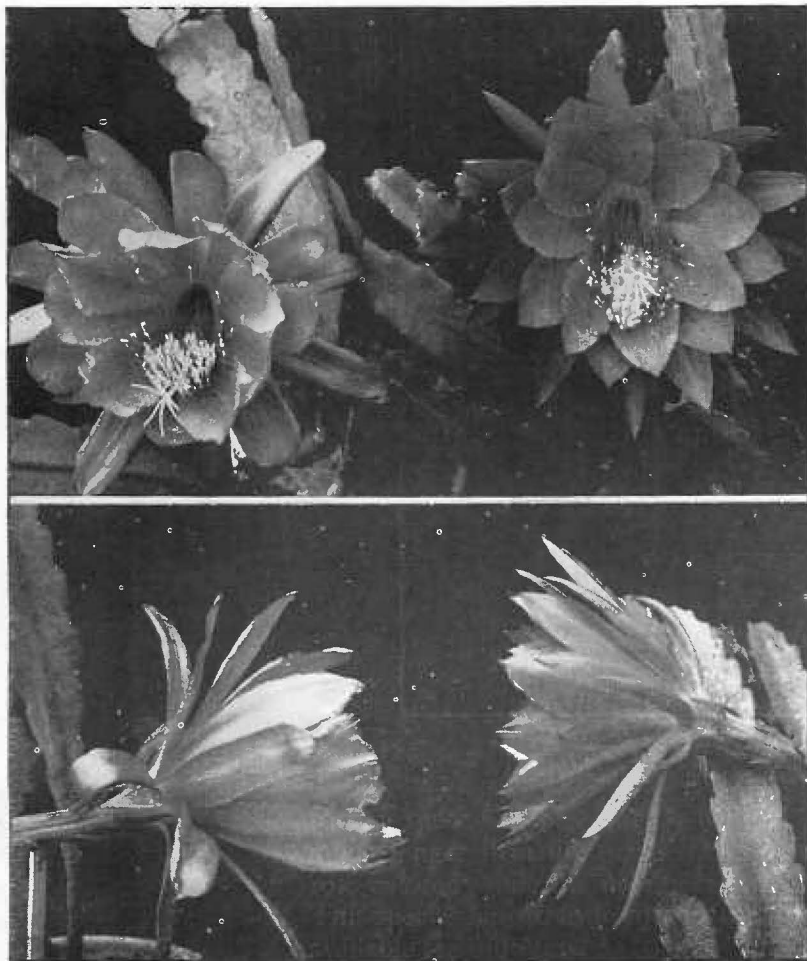


FIG. 156. *Phyllanthoides Grandiflorus* (orange-red) and *Dante* (orange-red with purple markings) are two old favorites.

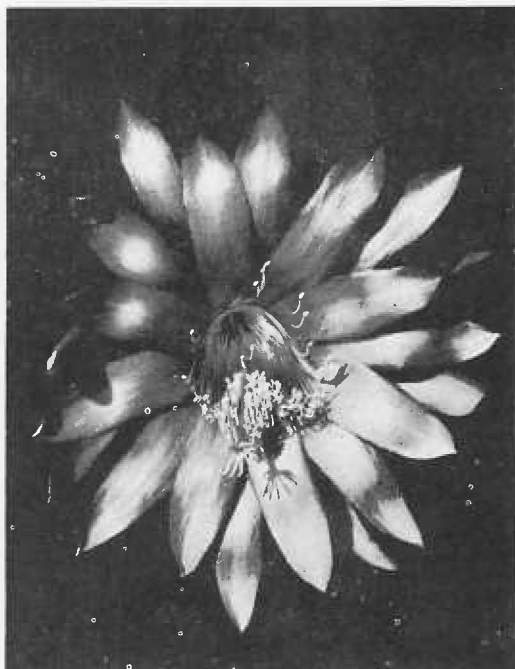


FIG. 157. Sunburst has a beautiful burnt-orange color; it was originated by Clarion Steele.

ous names such as Imp, Twinkling Star, Tiny Tim, Bambi, Star Dust, Gloria, are always popular.

In the past, too many names were "reserved" or used tentatively while a new flower was under observation. Perhaps a few plants were distributed and then abandoned because they failed to measure up to expectations. Many are likewise listed only once in a catalog and then dropped because they are found to be too near another variety. Names have been given flowers that cannot be recognized even by their originators. These abandoned names must be placed in a "Black List" or at best relegated to synonymy. Too much emphasis cannot be placed on the sub-

ject of names, or the industry will be short lived, and only a few people will continue growing these plants which should gain in popularity.

The classification of hybrids is more difficult than that of plants more clearly defined. Color of flower is perhaps the most outstanding quality with size and form second. Were it not for interbreeding, the types could be arranged according to the characters inherited from their parents. For example, the most dominant parent of *Epiphyllum* hybrids is *Heliocereus speciosus*, whose blood can be traced by the scarlet color of the flowers, short tube, broad petals, and weak stamens, and in the stems by the prominent felty areoles with short spines, three- or four-angled stems with a tendency toward a red coloration.

According to James West, hybrids can be classed into a few main types (excepting the many intermediate forms):

(1) *Cooperi* hybrids. These are descended from *Epiphyllum crenatum* and *Selenicereus grandiflorus*. Characteristics: The color of the flower is white, cream, or yellowish, sometimes dotted or blotched. Ovary spiny or with bristles and tube having scales. The outer perianth-segments are narrow, often brownish. In other words, the flower is like that of its *Selenicereus* parent. The flowers remain open for two or three days and are fragrant at night. The stem follows the *E. crenatum* parent.

(2) *E. crenatum* and *Nopalxochia phyllanthoides* crosses. The flower is bell-shaped, not spreading as in the last; it is pink, often dotted with crimson. Joints are broad, very dark green, vigorous growing, with small felty areoles, usually spineless.

(3) *Nopalxochia phyllanthoides* and *E. ackermannii*. The flowers are compact, dark pink to crimson shades, more or less cupped.

(4) *E. ackermannii* and *Heliocereus speciosus*. These plants are stout with deeply scalloped branches with margins and young growth usually red, often three-angled, also waved and spirally twisted. Areoles have bristly spines. Flower-tube is short and scaly. The petals are scarlet to purple, often shading to bluish

at the edges. The flowers last for several days. This type is more robust than most in its resistance to strong sun and cold. A well-known representative of this type is Conway's Giant.

#### SYMPOSIUM OF THE BEST KINDS

The selection of the *best* Epiphyllums and their hybrids depends entirely on a person's preference as to color of the flowers. Some growers prefer the strong reds such as Vive Rouge and Aristocrat or the orange shades such as Sun Burst, Gloria, Flamingo, and Cairo. Others like the pinks such as Padre, Adonis, or Roseus Superbus. The striped or vari-colored flowers appeal to some collectors, and include Hermosissimus and Marseillaise. The whites, too, have their place in collections and include the true species *Epiphyllum strictum* and *E. oxypetalum* as well as such hybrids as Eden, Moonrise, Pres. F. D. Roosevelt, and Snow Queen; in this group are the long-hoped-for yellows which to date carry yellow only in the outer petals such as Londonii. The magentas include Prof. Ebert and Bambi.

There may be a preference, too, in the size of flowers—some favoring the types with large flowers such as Conway's Giant or the small types such as Rosetta and Deutsche Kaiserin. Growers may have space for the basket types such as Pink Nymph and Dardanella or where space is at a premium they prefer to grow tall plants by the espalier method; the majority of the hybrids respond to this latter treatment, such as Argus and Padre.

In selecting a beginner's collection one may do well by growing the time-tested kinds rather than the newer highly-bred types. Select hardy kinds to experiment with such as *E. ackermannii* or the hybrid Ackermannii, Padre, Conway's Giant, *E. oxypetalum*, and Hermosissimus. Later can be added the new creations, many of which are superior to the old types. Watch the catalogs from year to year for the tested hybrids, and those which fail to qualify will finally drop out and be forgotten.

Throughout the world there is no doubt but that the Ackermannii hybrid is the most widely grown, often without the

knowledge it is a cactus. It survives and flowers year after year, several times each season, regardless of treatment. It is often seen

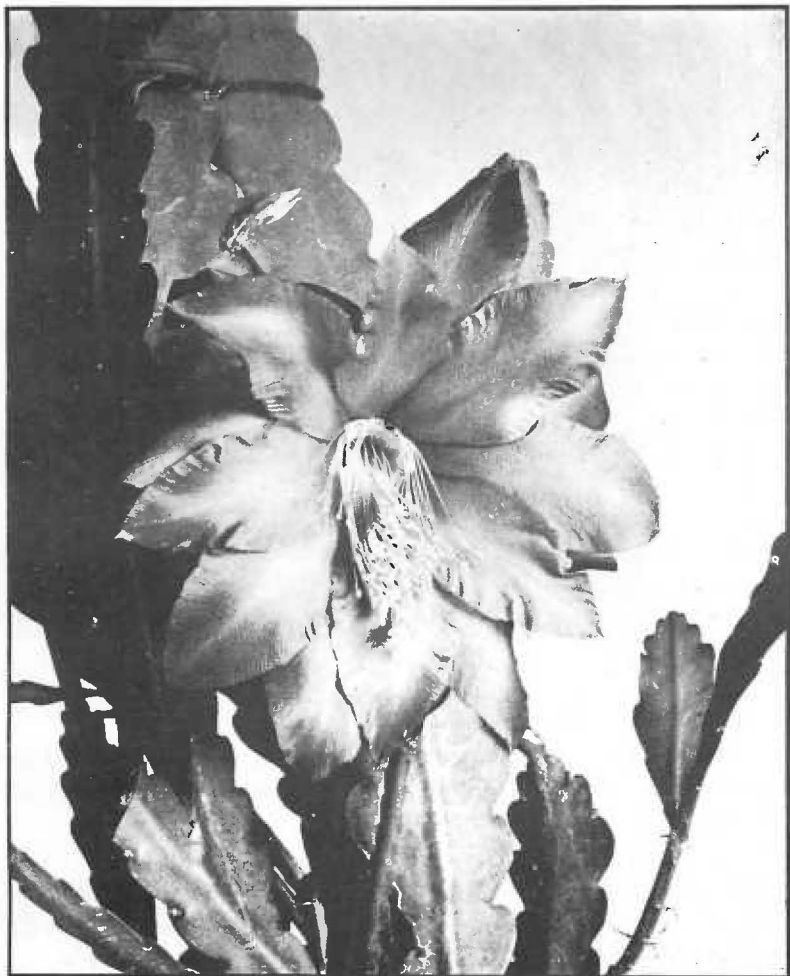


FIG. 158. Gen. Douglas McArthur is tangerine with ruffy edges on the petals. This and the pure white Pres. F. D. Roosevelt are two fitting tributes from the Ventura Epiphyllum Gardens.



FIG. 159. H. M. Wegener's Giant Old Rose has nicely shaped cupped petals.

as a porch plant. The flowers are not as large nor as colorful as many of the other hybrids but it will always be the forerunner in collections.

The erroneously-called Night Blooming Cereus is a widely grown house plant found in association with that famous dust-collecting "Rubber Plant." Actually it is the true species *Epiphyllum oxypetalum*. Because of its curved flower tube it is frequently called "Dutchman's Pipe." Its fragrant white flowers are borne among the leaf-like branches. This is the plant that local newspapers depend upon for an annual story about the



night vigil of neighbors who gather to watch the spectacular unfolding of the huge flowers.

The most popular hybrids or perhaps the best known are Conway's Giant, Hermosissimus, Gloria, Padre, Vive Rouge, Marseillaise, Prof. Ebert, Peacockii, Sunburst, Mon Cherie, Eden, and Amber Queen. Within a few years this list will be

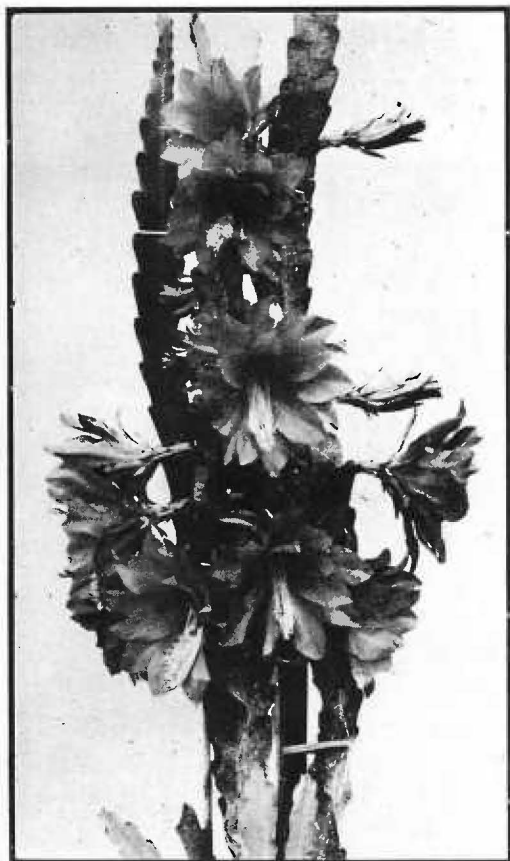


FIG. 160. Vive Rouge was named by Dr. A. D. Houghton in H. M. Wegener's garden and is one of the brilliant reds.

augmented with more of the beautiful hybrids produced by our own breeders. Each year breathtaking creations are being distributed as fast as stock can be grown.

Some of the dealers specialize in basket types, for example, the Deutsche Kaiserin hybrids. All are endeavoring to grow kinds that produce the most flowers over the longest period of time; thus a four months flowering season will be had, instead of a few short weeks. Following is a list of some of the early, late, and all season bloomers. Lists are arranged as early, mid-season, and late, in order to apply to localities where seasons are later than

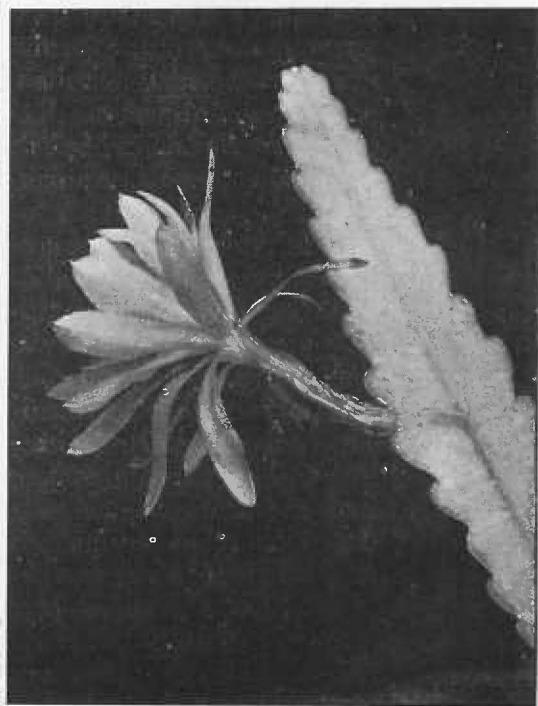


FIG. 161. Sun Goddess is another popular burnt orange. The plant has been known as Copper Color, Bronz, and Sun Fugitive.

in Southern California. The flowering period varies each year with the temperature and amount of sunshine. A cold spring will retard the flowers while early hot weather will advance the season. In Southern California this season usually begins the last of April, reaching its climax the middle of May to June 15th. The plants flower a longer time in a cool summer than in dry, hot weather. It is surprising how different plants of the same hybrid will flower at the same time whether in different locations in the garden or in other gardens within the same area.

**EARLY BLOOMERS:**

Ackermannii\*  
 Agatha\*  
 Latona\*  
 Padre\*  
 Vive Rouge\*  
 Joseph de Laet  
 Rosetta  
 Conway's Giant  
 Sun Goddess  
 Mount Hood  
 Augusta Zombathy  
 Marie van Hoorde  
 Dawn Glow

**FULL SEASON BLOOMERS:**

Ackermannii  
 Argus  
 Padre  
 Rosetta  
 Vive Rouge  
 Gloria  
 Conway's Giant  
 Desert Sunrise  
 Deutsche Kaiserin  
 Melody

**LATE BLOOMERS:**

Prof. Ebert  
 Pink Nymph  
 Poinsettia  
 Peacockii  
 Callender's Pfau  
 Jorg Siepke  
 Dante  
 Argus  
 Fire God  
 Nomad  
 Ecstasy  
*E. strictum* as well as all of the true species.

**MID-SEASON BLOOMERS:**

Hermosissimus  
 Marseillaise  
 Flor del Sol  
 Fortuna  
 Dr. E. Werdermann  
 Thunder Cloud  
 Tulip  
 Eden  
 And the majority of the other hybrids

---

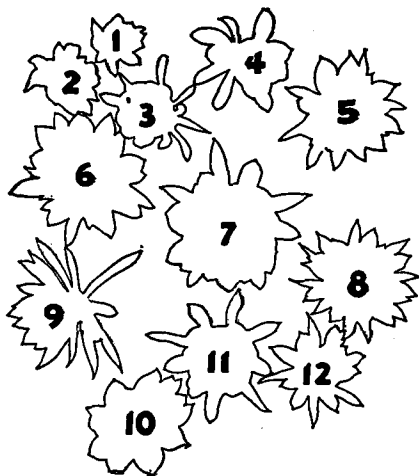
\* Extra early.

## OCCASIONAL WINTER BLOOMERS:

Ackermannii	Deutsche Kaiserin
Poinsettia	Padre
Argus	Rosetta
Autumn	Vive Rouge



FIG. 162. Flamingo is a Steele hybrid in shades of orange with a purple center.



KEY TO HYBRIDS IN FRONTISPIECE—PLATE I

1. ROSETTA, ROSE; 2. VALENCIA, ORANGE; 3. LONDONII, CREAM; 4. FAIRYLAND, ORCHID AND WHITE; 5. ROMANCE, SALMON; 6. GLORIA, SALMON; 7. PEACOCKII, RED AND PURPLE; 8. PROF. EBERT, MAUVE; 9. AD. TOGO, WHITE; 10. JENKINSONII, RED; 11. MARSEILLAISE, THREE-TONED; 12. BOHEMIENNE, FLESH.

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Italic type indicates a scientific plant name. Bold figures indicate an illustration. Capital letters indicate a family or a section.

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